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IS 4661 (1999): Glossary of terms used in paper trade and industry [CHD 15: Paper and its products]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

**GLOSSARY OF TERMS
USED IN PAPER TRADE AND INDUSTRY**
(Second Revision)

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BUREAU OF INDIAN STANDARDS
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FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Paper and Its Products (Excluding Packaging Materials) Sectional Committee had been approved by the Chemical Division Council.

This standard was originally published in 1968 with a view to eliminate ambiguity and confusion from different interpretations of terms used in paper trade and industry and establishing a generally recognized usage. The first revision of this standard was brought out in 1986 to bring the standard in line with ISO 4046 : 1978 published by the International Organisation for Standardization so as to include the terms used worldwide by the industry.

In this revision more terms have been added to this standard to make it more exhaustive and in line with the existing trade practices.

In case there is any difference between the definitions in this glossary and those in the standards for individual items, the later shall prevail.

The composition of the committee responsible for formulation of this standard is given in Annex A.

AMENDMENT NO. 1 NOVEMBER 2011
TO
IS 4661 : 1999 GLOSSARY OF TERMS USED IN PAPER
TRADE AND INDUSTRY

(Second Revision)

[Page 26, col 2, Definition of '**Board (Paper Board)**'] — Substitute the following for the existing definition:

“Board (Paper Board) : Generic term applied to certain types of paper frequently characterized by their relatively high rigidity.

NOTES

1 In the generic sense, the term '**paper**' may be used to describe both paper and board. The primary distinction between paper and board is normally based upon thickness or grammage, though in some instances the distinction will be based on the characteristics and/or end-use. For example, some materials of lower **grammage**, such as certain grades of folding boxboard and corrugating raw materials, are generally referred to as 'board', while other materials of higher grammage, such as certain grades of blotting paper, felt paper and drawing paper, are generally referred to as 'paper'.

2 For some purposes, materials of grammage less than 224 g/m² or thickness less than 0.3 mm are considered to be paper and materials of grammage 224 g/m² or above or thickness 0.3 mm or above are considered to be board.”

(Page 122, col 1, Definition of '**Paper**') — Substitute the following for the existing definition:

“Paper : Generic term for a range of materials in the form of a coherent sheet or web, excluding sheets or laps of **pulp** as commonly used for paper making or dissolving purposes, and non-woven products, made by deposition of vegetable, mineral, animal or synthetic fibres, or their mixtures, from a fluid suspension onto a suitable forming device, with or without the addition of other substances.

NOTES

1 Papers may be coated, impregnated or otherwise converted, during or after their manufacture, without necessarily losing their identity as paper. In conventional paper making processes, the fluid medium is water; new developments, however, include the use of air and other fluids.

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(Page 122, col 2, Definition of ‘Paper Board’) — Delete.

(CHD 15)

Reprography Unit, BIS, New Delhi, India

Indian Standard

GLOSSARY OF TERMS USED IN PAPER TRADE AND INDUSTRY

(*Second Revision*)

1 SCOPE

This standard defines the terms commonly used in the paper trade and industry in this country.

2 TERMINOLOGY

A

A/M Station (Automatic/Manual): A device that permits an automatically controlled system to be run manually by the operator.

Abaca Pulp: A pulp made from abaca fibre also called Manila hemp.

Abrasion Number: A number used to express, the relative abrasiveness of clays and similar minerals. Generally determined by noting the loss in weight of a piece of standard phosphor bronze mesh wire. The apparatus currently in use for this purpose is the Valley Abrasion Tester.

Abrasive Packing Papers: Well-sized kraft papers which are used as packing with a coating of sand, aluminium oxide, silicon carbide, garnet, and other abrasive materials used for sanding and smoothing of wood, metals, etc. Glue is normally used as the bonding agents.

Abrasive Paper: Relatively light to heavy grammage chemical pulp or hemp fibre papers coated on one side with an abrasive material like flint granite, aluminium oxide, bauxite, silicon carbide coatings, etc.

Abrasiveness: The property of a substance expressing the degree to which it abrades or wears away another surface by friction. This property is of importance in both paper manufacture and paper uses. Filler pigments should have low abrasiveness to minimise wear at paper machine components. Both filler and coating pigments can contribute to abrasiveness in paper causing undue wear in printing machines.

Absorbancy and Absorptive Capacity: The characteristic of a given paper or board to absorb liquid (usually water unless stated otherwise) measured by standard methods of test. This property is indicative of the volume of the pores and interstices available in paper or board.

Absorbent Paper: Unsized paper which is of highly or partially absorbent character, such as filter paper, blotting paper, facial tissue paper, etc.

Accelerated Ageing Test: An evaluation of pulp or paper, products, and raw materials in the pulp and paper making process where an artificial fast method of ageing is used to determine the effects of time on their chemical and/or physical properties in order to predict useful life span.

Accept: A generic term for any material which is not rejected by cleaning and/or screening.

Acceptance Sampling: The statistical technique obtaining representative sample of pulp, paper, paperboard, raw material and process material from a lot for testing its conformity with the laid down specification.

Accepted Stock: Pulp stock that is sent on for further processing in the paper making operation after passing through screens of cleaners.

Accepted Chips: Chips which are screened for a specific size and thickness then sent to storage bins in the pulp mill for subsequent processing in digesters or mechanical pulping equipment.

Accepts: The portion of material (chips, stock, water, etc) which is sent on for further processing by some type of screening, cleaning, classification, etc. That portion of material not 'accepted' is recycled for further processing or disposal.

Accelerating Agent: A material used to hasten a particular act of process. Often used in tests to determine the effect of time on chemical and/or physical properties or processes. Heat, light, moisture, and certain chemicals are among the most common ones.

Account Book Paper: White or light buff, hard sized, writing papers having good strength properties and erasability.

Accoustical Board: A building product used on ceilings walls to absorb sound or as a thermal insulator. It is commonly made in the same manner and from the same material as low density fibrous insulating board, that is from wood, straw, bagasse, etc, refined to coarse pulp, and formed into sheets in the range of 10 to

25 mm in thickness on a vat machine and dried in a drier. It is commonly cut into tiles of relatively small size.

Acid Alum: $\text{Al}_2(\text{SO}_4)_3 \cdot 14 \text{H}_2\text{O}$; $\text{Al}_2(\text{SO}_4)_3 \cdot 18 \text{H}_2\text{O}$ or a mixture of these hydrates commonly used for precipitating the resin size onto pulp to impart water-resistant properties to the paper. It characteristically produces low pH in machine water some times caused by residual acid from which it is manufactured.

Acid Grinding: The addition of acid to a pulpwood grinder shower, or the impregnation of logs with acid and subsequently grinding to increase pulp strength and reduce specific grinding energy. Recently, instead of acid, caustic soda is used.

Acid Number: The amount of free acids in fats, oils, waxes and resins expressed as the number of milligrams of potassium hydroxide (KOH) required to neutralize 1 gram of the material used.

Acid Resistant Paper: (a) Paper which has been treated to resist the action of acids or acid fumes. (b) Paper specially dyed with colours which are resistant to acids and their fumes. Manila, kraft, and wrapping papers may be used.

Acid Size : A rosin size which contains a considerable portion of unsaponified but emulsive free rosin. If dilution of such size produces a milky emulsion, it is known as white size. It is used to impart to paper resistance to penetration of water or other aqueous inks.

Acid Stable Size: A wax or waxed rosin emulsion, which is not coagulated under acidic conditions.

Acid Wash: The conditioning of paper, pulp, board, or any other materials in the pulp and paper making process in order to remove any undesirable caustic-type contaminants by reacting acid with them, and then washing the acid away, usually done with water which results in a product free from these undesirable caustic components.

Acid Free Paper: Paper which does not contain any free acid or acid generating substances, special precautions are taken during manufacture to eliminate any such substance that might be present in the furnish. It is used as wrapping or protective paper for application where (a) paper acidity would be harmful to the material in contact with the paper. (b) A permanent record paper where the acidity would age the paper deterioration.

Acid Dyes: Aniline base organic dyes so named because they are in the form of sodium salt of dye acids. As a class, they have greater solubility and less tinctorial value than basic dyes but are much faster to light, on mixed furnish, they give more even dyeing

than basic or direct dye stuffs. They have no direct affinity for cellulose. Acid dyes are also extensively used in surface colouring.

Acid Proof Paper: An industrial or packaging type paper coloured with dyes which do not discolour when exposed to acidic substances.

Achromatic Colour: The colours possessig no hue such as white, black and greys.

Acrylic Latexes: Polymer and copolymer particles dispersed in water and used as coatings on board to provide good water resistance, high gloss ink and varnish hold-out, and good glueability.

Acrylics: Group of synthetic binders, coatings and adhesives formulated to develop good contact with surfaces of pigment and cellulose fibre surfaces. They provide high bond strength on dry paper or boards, as well as on wet products. They also have good water resistant properties, with an absence of odour on dried coating and excellent light stability.

Activated Sludge: Sludge floc produced in raw or settled waste water by the growth of aerobic bacteria and other similar organisms in the presence of dissolved oxygen and accumulated in sufficient concentrations by returning floc previously formed.

Activated Sludge Loading: Biochemical oxygen demand (BOD) in the applied waste water per unit volume of aeration capacity or a kg of activated sludge per day.

Activated Sludge Process: The treatment of pulp and paper mill affluent with nutrients like urea and soluble phosphates and intensive aeration to feed oxygen to develop fast aerobic bacterial action.

The sludge so formed is recycled in the system to improve BOD and COD values of the treated waste water.

Activated Solids: The combination of organisms in waste water sludge produced in the presence of dissolved oxygen in activated sludge treatment.

Activity: The active alkali content divided by the total alkali in alkaline cooking liquors, all expressed as Na_2O and calculated on a percentage basis. For sulphate cooking liquor the formula is as follows:

$$\frac{\text{NaOH} + \text{Na}_2\text{S}}{\text{NaOH} + \text{Na}_2\text{CO}_3 + \text{Na}_2\text{S} + \frac{1}{2} \text{Na}_2\text{SO}_3} \times 100$$

$$\text{For soda cooking liquor: } \frac{\text{NaOH}}{\text{NaOH} + \text{Na}_2\text{CO}_3} \times 100$$

Active Alkali: The caustic soda (NaOH) and sodium sulphide (Na_2S) content in sulphate cooking liquor or white liquor expressed as Na_2O . In the soda process, it is caustic soda (NaOH) expressed as Na_2O .

Active Alkali to Wood Ratio (AAWR): The ratio of the amount of caustic soda and sodium sulphide in

fresh cooking liquor to the amount of wood being cooked with it. It is calculated as weight per ton of oven dry chips.

Active Sulphur: Sulphur and sulphur compounds in the sulphate pulping and chemical recovery process that are converted to sodium sulphide.

Actual Weight: The absolute or actual weight of a ream or reams and a package or packages of paper and paper board. This is different from the nominal weight which is used for 'billing purposes'. It may be higher or lower than the nominal weight within specified tolerance limits.

Adding Machine Paper: A writing paper furnished in small rolls used on adding machines, calculators and like. It is characterised by lint free surface, uniform caliper, smooth finish and good printability.

Addition Polymers: Long chain link chemical compounds that make up the constituents of wood, pulp, chemical, and additives used in the paper industry.

Additives: A general term for wet end additives which includes loading, sizing, colouring materials, dispersing and flocculating agents. It includes substances like starch, alum, wax emulsion, vegetable gums, resins, optical whiteners, pigments, etc., added to the stock during its preparation for making paper and board (*see* Beater Additives).

Address Label Paper: A writing or packing paper commonly used in the preparation of address labels. It is usually made from chemical and/or mechanical pulp in white or colours.

Adhesives: Any substance which causes adhesion between two or more bodies or surfaces. Typical adhesives used in paper making, coating and converting are animal glues, gelatins, starches, dextrans, resins, synthetic latices, caseins, silicates, asphalt compounds, waxes and various thermoplastic materials (*see* Beater Adhesives).

Adhesive Migration: The intrusion of surface adhesive coating of a sheet into the base structure. It is considered a defect when the intrusion is beyond desired limits.

Adhesives Papers: A paper coated with any of the several types of adhesive such as water activated adhesives, solvent activated adhesives, heat activated adhesives or pressure sensitive adhesives used for direct adhesive purposes.

Adhesive Ratio (AR): The amount of adhesive required to bind pigment to a predetermined coating. Strength varies with the type of pigment and is expressed as the adhesive ratio (AR) in parts by weight of adhesive required to bond 100 parts of pigment to some determined coating strength.

Adiabatic Conditions: A description of processing conditions under which the system is perfectly insulated so that no heat is exchanged with the surroundings.

Adjustable Speed: A term used to describe pulp and paper making equipment, the speed of which can be varied gradually over a considerable range, but when adjusted remains practically unaffected by load. For example, a shunt motor is designed for considerable range of speed variations, and it is used to drive adjustable speed pumps and other pulp and paper mill machinery.

Admixture: Something added by mixing which is very common in the stock proportioning phase of paper making. It is essentially a blending or mixing of dyes, chemicals, and additives with a combination of various types and species of pulp fibre.

Adsorbate: A substance that is taken up by pulp, paper, board or other pulp and paper making materials, such as water, ink, additives, coatings, etc.

Adsorbent: A material that takes up moisture and liquid without any physical or chemical changes taking place in the process. Activated bauxite, alumina, charcoal, and silica gels are good examples, also referred to as sorbent.

Adsorption: The pick up of substances by capillary action of fibre in the voids of the sheet or retention of thin films of gases or fluids with which they come in contact.

Adsorptivity: Having the ability to take up moisture and liquid without physical or chemical changes.

Advanced Waste Treatment: Any treatment method or process employed following the primary clarification and secondary biological treatment of waste waters (a) to remove further polluting materials, (b) to remove substances that may be deleterious to receiving waters or environment, (c) to produce a high quality effluent suitable for re-use in any specific manner or for discharge under critical conditions.

Aerate: To carry on the process of aeration, that is creating intimate contact between air and a liquid.

Aerated Pond: A natural or artificial waste water treatment pond in which mechanical aerators or diffused air aeration are used to accelerate the oxygen supply.

Aeration: The bringing about of intimate contact between air and a liquid by spraying the liquid in the air, bubbling air through the liquid (diffused aeration), or by agitation of the liquid to promote surface absorption of air (mechanical aeration).

Aeration Basin: A depressed area or pond area where air is introduced into liquid, as in a paper mill secondary effluent water waste treatment system. Also

referred to as aeration lagoon. Some times also called Aeration Tank or Aeration Pond.

Aerator: The device that disperses air during the aeration process of mill effluents.

Aerobic: A process requiring of free oxygen usually supplied by mechanical aerators or oxygen cylinders.

Aerobic Biological Oxidation: Any waste water treatment of process utilizing aerobic organisms in the presence of air or oxygen as the agent to reduce biochemical oxygen demand into harmless compounds and thus reduce the pollution load in waste. The term is used in reference to secondary treatment of liquid wastes.

Aerobic Digestion: Digestion of suspended organic matter by means of aeration.

Aeromic Process: A biological process which takes place in an atmosphere where oxygen exists.

Aerodynamic Dry Forming: A paper and paper board sheet manufacturing process using the principle of introducing fibres into a high velocity air stream which deposits the fibre on a moving wire and recirculates all the air.

Affinity: The attractive force of pulp and paper making materials that causes them to combine and to remain in combination with each other. Affinity is a desirable characteristic in dyes and additives during the sheet formation stage.

Agalite: A grey hydrated magnesium silicate used as a natural filler in paper making (*see* Asbestine).

Agate Marble Paper: A paper made from chemical pulp and used for end leaves in books. It has a distinctive surface decorated with colour, strains resembling the banded appearance of agate glass.

Age: To condition paper and pulp in such a manner as to approximate the length of time it takes to diminish certain physical properties such as strength and brightness (*see* Ageing).

Ageing: Irreversible alteration leading to deterioration of the characteristics like strength properities, brightness and shade of pulp, paper or board produced in the course of time.

Agent: Something that produces or is capable of producing an effect. It is commonly used when referring to dyes and additives in paper making. It also refers to chemicals in other parts of the process such as oxidizing and reducing agents.

Aggregate: The result of the exertion of agglomeration forces in dry pigment coatings.

Aggregates: Classes of dry pigment coatings that are characterized by strong agglomeration forces.

Agitate: To keep the contents of a storage tank in motion and well mixed by mechanical, pneumatic or other means.

Agitation: The process of agitating by use of mechanical, pneumatic or other means.

Agitator: Mechanical or other equipment provided in or on storage chests to keep contents in motion and well mixed. Agitators are generally classified as internal or external.

Ahmedabadi: Supercalendered account book paper.

Air: That medium which normally exists in the atmosphere and theoretically consists (by mass) of 23 percent oxygen and 77 percent nitrogen; or (by volume) 20.7 percent oxygen and 79.3 percent nitrogen. At NTP one kg of air occupies 0.773 m^3 volume, out of which oxygen constitutes 0.162 m^3 and nitrogen 0.611 m^3 volume.

Air Balance: Ratio of supply to exhaust in any pulp and paper mill building, unit process, or air system.

Air Blower: A mechanical device that moves air into desired areas such as in air dryers. It is similar to air fans in housings except higher volumes of air are handled at higher velocities.

Air Bubble: *See* Air Entrainment.

Airborne: A method of supporting or transporting material by use of a cushion of air, such as in the moving of a paper sheet through an air dryer or the blowing of fluffed pulp through an air dryer.

Air Cushion Deadbox: A pressurized type of paper machine head-box which has a cushion of pressurized air called an air pad above the stock pond level.

Air Deckle: The untrimmed feather side edges of a sheet of paper made on the fourdrinier or cylinder wire by means of a jet of air.

Air Doctor: A long, thin jet of air acting as a flexible doctor blade which meters off the controlled excess of previously applied coating on a paper coater, leaving the correct weight of coating on the sheet.

Air Dry (AD): Refers to mass of pulp or paper or any other material which is in equilibrium with the atmosphere the moisture content of which depends on the condition of the atmosphere to which it is exposed. Air Dry means pulp or paper containing 10 percent moisture by mass. Air-dried mass is determined by dividing the oven-dry (or bone dry) mass by a factor of 0.9.

Air Dry Paper or Board: Paper or Board dried by exposure to Air.

Air Dry Pulp: Pulp with the moisture content in equilibrium with that of the surrounding atmosphere. According to the trade customs, pulps are generally understood to be air dry when they contain 10 percent moisture.

Air Drying: Method used for drying pulp, paper or board or any other material. Air drying in sheets is generally carried out by suspending them in freely circulating air. In the web, it is generally carried out

by contact with heated air either in a room or in a tunnel.

Air Entrainment: The trapping of air in white water or pulp stock, slurries caused by mechanical agitation in the process, for example by equipment in motion such as pump impellers and agitators. It is the primary cause of foam which impeded operation of screen, filters, cleaners, wires and other process equipment (see Air Bubble).

Air Exhaust: The outlet side of any pulp and paper making process or machinery discharging air into the surrounding atmosphere.

Air Hood: A canopy located over the dryer section of a paper machine. It is used to confine and control vapourladen air rising from the dryer section so that the heat may be recovered. This is done by using heat to heat air entering the machine room. The 'open' type hood is usually a canopy over the top of the dryers with side panels extending down to the journals of the top dryers. The 'closed' type hood has side panels that extend to the paper machine room floor, and they may also extend into the basement.

Air Heater: Equipment used to preheat air before being used in pulp and paper making process. This can be done by the use of steam coils or by the use of hot gases such as these from power and recovery boilers with tubular-type heat exchangers or by the use of electric heaters.

Air Impingement: A method of heat transfer in the paper industry using impinging air jets to provide high heat transfer rates, such as in the drying of lightweight paper grade of tissue and toweling. The sheet is usually dried on a steam-heated cylinder (Yankee dryer) with drying rates sugmented by the use of a round or slot-shaped, high-velocity impinging hot air jet.

Air Intake: The inlet side of any pulp and paper making machinery using air for processing or in its operation.

Air Jet: Round or slot-shaped air supply ports designed to increase the velocity of an air stream where desirable in the pulp and papermaking process, such as in the drying of light weight papers. It is sugmented by the use of impinging hot air jets to provide high heat transfer rates.

Air Jet Coating: See Air Knife Coating.

Air Knife Coating: A roll coating method in which the applied coating slip is levelled and the excess removed by means of a uniform stream of compressed air (air knife) suitably directed from a slot placed across the machine in close proximity to the coated surface of the roll-supported web.

Air Load: The pressure of air used in pneumatically operated process equipment.

Air Loaded Tension Device: A device which applies tension to a piece of equipment and is driven by air. It

is used to control tension of the paper sheet or felt on a paper machine.

Air Makeup: Additional air that is introduced in large quantities into the paper machine room, into the basement, in back of the machine, in the drive aisle below the fan mezzanine, or into adjacent buildings from which it can find its way into the machine room in order to attain proper air balance in the paper mill when the regular air supply units cannot keep up.

Air Pad: That portion above the stock in a pressurized headbox that is filled with air and whose pressure is controlled to maintain a desired total head and level in the headbox.

Air Permeability or Air Permeance: A paper sheet characteristic which denotes its ability to allow air to pass through it. It is measured by subjecting a specified sample to standard pressure differences across its boundries under known conditions of temperature and relative humidity and determining the rate of air flow. Some times incorrectly referred to as vapour permeability and porosity.

Air Pollution: The presence of contaminants gaseous or solids in the air in concentrations that prevents the normal dispersive ability of the air and that interfere directly or indirectly with public health, safety or comfort of living beings and also affects adversely the plant life.

Air Port: (a) The covered opening of the pressurized air section of a paper machine head box; also used as a cleaning port. (b) In Soda Recovery Furnace or in Boilers it denotes the opening meant for air inlets (primary and secondary) to control proper combustion.

Air Quality: The purity of air used in the pulp and paper making process. Also refers to the level of pollutants in outside air.

Air Quality Standards: The prescribed level of pollutants in the atmosphere that can not be exceeded legally during a specified time in a specified geographical area.

Air Mail Paper: A light weight writing and printing paper of good opacity. The grammage is generally in the range of 18 to 35 g/m² mostly being 29/30 g/m².

Alabaster Paper: Paper with the appearance of alabaster, achieved by coating it with lead acetate crystals.

Albert Type Printing: See Collotype Printing.

Albumen (Albumenized) Paper: Paper used in photography, coated with albumen (Albumin) from white eggs mixed with ammonium chloride and then treated with silver salts.

Album Board: A thick, heavy cover paper used in making photographic albums. It is usually made in solid black or grey colour.

Album Paper: A cover paper used principally for making photographic albums and also made in smudges colours such as black, grey of any other solid colour. It is characterised by a stiff surface which will take paste without cockling, wrinkles and free from any impurities which might discolour photographic prints. When the paper is thick and heavy, it is sometime referred to as Album Board.

Algae: Microorganic plant life that forms in paper mill water supplies and causes problems in the water treatment plant by clogging filters, screens, showers, etc. They may impart tastes and odours which are carried through to the finished paper. They also tend to colour the water and cause discoloration of pulp when water is used for bleached pulp washing.

Algicides: Chemicals introduced into the paper water supply to discourage the growth of algae.

Alkafide Process: A variation of the kraft process using hydrosulphide (Sulphide-type cooking chemical). It was developed for continuous cooking using a two-body digester for a two-stage cook.

Alkali: Sodium or Potassium base chemicals such as those found in sulphate pulping liquors; sodium hydroxide, sodium sulphide and sodium sulphite. Also used to refer to sodium hydroxide (NaOH) and its solutions.

Alkali Cellulose: A compound resulting from the treatment of celluloses with sodium hydroxide. Its preparation is a stage in the manufacture of viscose rayon.

Alkali Consumption: The total amount of alkali used up during the cooking phase of wood. It is determined by calculating the total alkali in fresh cooking liquor and subtracting the calculated total alkali in the spent liquor. It is usually expressed in quantity consumed per tonnes of oven dry (OD) pulp produced.

Alkali Extraction: The second stage in a pulp bleaching sequence where the first stage is chlorination (in which chlorine is added and allowed to react with the pulp slurry). The resulting chlorinated fibre residuals and other alkali-soluble constituents are then dissolved in the second or 'Alkali' extraction stage.

Alkali Reactive Binders: Additives used as binders in making paper and paperboard which require alkali conditions to become set up or established within the sheet.

Alkali Solubility: The fraction of cellulosic material that is soluble in alkali solutions of fixed concentration under specific conditions of testing.

Alkali Resistant Paper or Board: A paper or Board with a high degree of resistance to alkali used in the wrapping and packing of alkaline materials such as soaps, adhesive, etc.

Alkaline Agents: Chemical substances having markedly basic properties, that is NaOH and NH_4OH , usually added for the purpose of raising pH.

Alkaline Balance: The proper ratio between sodium hydroxide (NaOH) and sodium sulphide (Na_2S) in sulphate liquor.

Alkaline Cooking Liquor: Cooking chemical solution made up of sodium-based compounds such as NaOH, Na_2S , Na_2CO_3 and $\text{Na}_2\text{S}_2\text{O}_3$. Also referred to as kraft pulping liquor or soda pulping liquor.

Alkaline Fillers: Fillers which give rise to an alkaline reactions in the presence of water or which react with acids. Calcium carbonate is the most common alkaline filler.

Alkaline Paper Making: The manufacture of paper on a paper machine under alkaline conditions by the use of additives, caustic fillers such as calcium carbonate (CaCO_3) and neutral size. Paper made under these conditions is usually used in special applications documents, books, maps (where ageing resistance is important), milk carton stock, cigarette papers.

Alkaline Peeling: The reaction and removal of carbohydrates at lower temperatures ($60\text{--}160^\circ\text{C}$) during a kraft cook.

Alkaline Process: A chemical process of digesting fibrous raw material such as wood, bamboo, grasses or agricultural residues in an alkaline cooking liquor in order to remove the lignin and resinous matter the adhesive like fibre bonding components, and thereby free the individual cellulosic fibres for subsequent purification and application in paper making.

Alkaline Pulp: Pulp made by the cooking of chips with alkaline-based chemicals. Sulphate and soda pulps are examples.

Alkaline Pulping: The process of cooking chips with alkaline-based chemicals.

Alkaline Size: A process of procedure for introducing water resistance into paper and board at pH values in excess of 7.0 in the stock at the point of sheet formation.

Alkaline Sulphite: Refers to a pulping process in which the cooking liquor consists of sodium hydroxide and sodium sulfite.

Alkalinity: The amount of free alkali present in pulps and other materials.

Alkalization: The addition of sodium hydroxide or other alkaline materials to protein binders in paper and paperboard coating for the purpose of deflocculation.

Alkali Proof Paper: Paper resistant to alkali used in packaging alkaline materials such as soaps and adhesives. It is made with a variety of furnishes, primarily semi-bleached and fully bleached chemical pulp.

Alkyd Group: A group of resin derivatives used in making shellac, lacquers, emulsions and adhesives used in the paper industry.

Alkyd Resins: Types of synthetic resins described as oil-modified polyester resins. As surface coatings they provide tough, versatile and uniform finishers. They are widely used in paints and printing inks.

Alkylation: The process of modifying starch to be used as an adhesive by treatment with alkali.

Alkylketene Dimers: A sizing agent used for internal sizing of paper particularly in neutral or alkaline sizing.

All Directional Strength: See Crepe.

All Rag Paper: Paper made entirely from rag pulp, but this may accidentally contain a small amount of non-rag fibres.

Allowable Cut: The quantity of pulpwood that should be removed from a woodland in which good forest management is being practiced to achieve a sustained and substantial yield.

Alloy: A metallic material made up of a metal mixed with a more valuable metal to give durability, anticorrosiveness or some other desired quality. Examples are stainless, steel, hastelloy, stellite, etc. It is commonly used in pulp and paper making equipment, particularly in corrosive environments such as the bleach plant.

Alpha Cellulose: That fraction of a cellulosic material which is not dissolved in 17.5 percent (w/w) caustic soda solution under specified conditions.

Alpha Pulp: A specially processed chemical pulp of high alpha-cellulose content. It was developed especially for the manufacture of speciality papers such as photographic, overlay, printed design paper for laminates, resin-saturating papers, and gasket papers. It is also referred to as dissolving pulp when used to make products which involve a 'chemical conversion' of the cellulose fibre into a different physical form or to some derivative, for example pulps for the manufacture of cellophane, textile rayon, cellulose acetates, cellulose nitrates, etc.

Alpha Writing Paper: Writing paper made from esparto pulp. It is also referred to as esparto paper when it includes printing and other papers made from esparto pulp.

Alum: A term commonly but incorrectly used by papermakers for various qualities of sulphate of aluminium. Also called Paper Maker's Alum. Chemically it is $\text{Al}_2(\text{SO}_4)_3 \cdot 14 \text{H}_2\text{O}$, but the molecules of water may vary according to the basicity of the product generally paper maker's alum is basic in nature and may have some contamination of iron.

Alum Spots: Imperfections in papers caused by undissolved crystals of alum which are crushed and fall out in the drying or finishing operation.

Aluminas: Paper coating pigments used as titanium extenders, having particle uniformity and no grit. They improve the brightness of papers.

Aluminium Chloride: In solution, it is used to reduce sulphate ions when melamine formaldehyde resins are employed for producing wet strength in the manufacture of paper.

Aluminium Coated Paper: A paper which is coated with aluminium and made by incorporating flake aluminium powder with casein or other aqueous-sizing vehicle, or with lacquers in organic solution to form a coatable composition, and applied by brush or other coating means.

Alumina Hydrate Pigments: Types of alumina coating pigment prepared by hydrolysis of sodium aluminate liquors that are completely free of organic material and are available in a variety of size ranges below 5 microns down to about 0.5 microns. They are also referred to more specifically as alumina trihydrate pigments, which is the type used in paper coating and as filler.

Aluminium Paper: A base paper of ordinary wrapping weight coated with aluminium powder. It is sometimes made by incorporating the aluminium powder in the paper at the beater or in the sizepress.

It is used for a variety of wrapping purposes particularly for wrapping food products and tobacco.

Alizarin Dyes : Acid-type dyes used as colourants for aqueous mineral coatings and prepared by precipitating fatty acid complexes of their metallic (other than alkali metals) salts on a substrate of aluminium hydrate. Also called anthraquinone dyes.

Ambient Air: Air that exists external to the process, around the pulp and paper manufacturing equipment, and out and around the mill buildings.

Ambient Pressure: The pressure of the air or medium outside and surrounding the process, pulp and paper manufacturing equipment, and around mill buildings.

Ambient Temperature: The temperature of the air or medium outside and surrounding pulp and paper making process and equipment.

Ammonia Paper: T-type of sensitized paper used for making copies of drawings by ammonia process (*see* Sensitised Paper).

Ammunition Paper: A variety of paper with good stiffness, strength and non-corrosive properties and uniform in caliper used in the manufacture of ammunition such as cartridge paper, which forms the tube section of a shotgun shell, and basewad paper, which is dense paper used in the base of the shell. The paper is usually made on a cylinder machine from rag,

flax, chemical pulps, or a combination of high-grade, reclaimed paper stock.

Amorphous Cellulose: That part of the molecular structure of cellulose which is noncrystalline and will not produce a coherent diffraction pattern when subjected to X-rays.

Amorphous Regions: Portions in cellulosic fibres which on the basis of X-ray diffraction or other techniques, do not show evidence of crystalline structures.

Amphoteril Starch: *See* Starch.

Amylopectin: One of two molecular configurations (branched chain) existing in starch used in papermaking. It is composed of 1-6 linkage polymers and makes up 75 percent of the starch. The remaining portion is amylose (Linear chain).

Amylose: *See* Amylopectin.

Amines: Types of resins widely used in liquid form in adhesive for plywood and lumber core gluing and laminating, in textile and paper treating, and in surface coatings that provide scratch proof finishes. It also improves wet strength, rub resistance, dry tensile strength, and bursting strength of paper. Also referred to as iminoreins.

Anaerobic Biological Treatment: Any waste water treatment method or process utilizing anaerobic or facultative organisms in the absence of air or oxygen for the purposes of reducing the organic matter in waste water or organic solids settled out of wastes, commonly referred to anaerobic digestion, or anaerobic digestion when applied to the treatment of sludge solids.

Anaerobic Process: A process which takes place only within an atmosphere free of oxygen. It usually refers to biological processes (*see* Anaerobic Biological Treatment).

Aniline Dyes: Currently, a broad range of synthetic organic dyes and pigments, so named because of such dyes originally made from aniline derived from coal tar. They are classified according to the degree of brilliance that is tinctorial value or fastness to light such as basic dyes which have extreme brightness, but are not fast to light, acid dyes which are less brilliant, but are faster to light, and direct dyes which have the least brilliance, but are fastest to light.

Aniline Printing: A rotary letter press printing process using ink made of aniline dyes and pigment (mixed with a binder) that dries primarily by evaporation due to the solvent vehicle (with rapid evaporation properties) used. The process is generally used for printing on media such as paper, paperboard, laminations, films, and foils. It is commonly known as flexographic printing because of the rubber plates and rolls employed in the process.

Analysis: The methodical investigation of a problem and the separation of the problem into smaller related units for further detailed study, or the determination and identification of components of a substance or material by subjecting it to chemical or physical tests, usually in a laboratory.

Analytical Filter Paper: A specially prepared filter paper used for chemical analytical work. There are two principal types that is qualitative and quantitative. High retentiveness of fine precipitates and high filtering rates are important characteristics. In addition quantitative filters must have ash content in traces only. Some grades are used in analysis in paper chromatographic methods.

Anemometer: An instrument for measuring and indicating the force or speed of wind, commonly used at a boiler house and sometimes used to measure speed of air flow or air streams in the paper mill.

Angiosperms: Plants having their seeds in an enclosed ovary such as hard wood, esparto bagasse, flex, jute and cotton.

Angle Cut Paper: Paper cut into sheets at an angle other than a right angle to the machine direction. This is generally used for punching out envelope blanks without waste.

Angle of Contact: The angle formed by a liquid or surface coating spread on paper when the surface tension of the liquid is greater than the adhesive tension for the fibre.

Angle Valve: A type of valve used in mills for installations in pipe lines to adjust horizontal flow in the side and vertical flow at the bottom.

Anhydrate: Anhydrous form of either natural or calcined calcium sulphate (CaSO_4) derived from ground gypsum. It is used as a paper loading material. Also referred to as Alabaster, Annaline, Gypsum, Pearl filler, and tissue filler.

Animal Fibres: Paper Making fibres obtained from animal sources such as wool and other animal hairs.

Animal Glue: Organic colloids of complex protein structure obtained from animal materials, such as bones and hides from the meatpacking and tanning industries. It is used for gumming, tub sizing, and adhesive for paper coating and general adhesive.

Animal Size: A size used in paper making made from gelatin and glue obtained from slaughter house waste.

Animal Tub Sized Paper: A paper which is sized after manufacture by treating its surfaces with sizing composition containing gelatine and/or other animal glue.

Anion Exchange: The term applied to a variety of synthetic surface active resins of high molecular weight polymers. Their basic character is due to the

presence of anion, substituted anion or quaternary ammonium groups (*see* Anion Resin).

Anion Exchanger: A unit of deionisation system, where anions such as Cl^- , SO_4^{2-} , NO_3^- are exchanged by liberation of OH^- ions.

Anion Resin: A highly basic synthetic resin unfunctional in lead form based on isoporous cross-linked polystyrene. It is a type of resin having trimethyl ammonium active groups and used in anion exchange process. It is regenerative by sodium hydroxide.

Anionic: A negative electrical charged ionic particle. Anionic materials in liquid, when subjected to electric potential, migrate to positive pole or anode. Anionic surfactants are commonly used as polymerization emulsifiers and stabilizers in paper coatings. Paper pulps also acquire anionic (a negative) charge when suspended in water. Other examples of anionic materials used in paper. Industry are anionic retention and flocculation aids, acid dyes, direct dyes, etc.

Annual Crop Fibres: Pulp and paper making fibres derived from nonwoody plant species, and only considered suitable when harvested on a seasonal basis (usually only one growth period per year).

(*See also* Crop Fibres, Agricultural Residues).

Antacid Manila Paper: Acid-free paper made from manila rope or sulphate pulp so that it is suitable for one of its more common uses as insulation on wire or cable. It is referred to as cable paper when used as such. It must also be free of foreign materials and have high dielectric strength and a lower power factor.

Anthraquinone: A quinoid compound added to alkaline pulping to improve yield and increase delignification rate. Use of anthraquinone in minute quantity acts as catalyst to induce better delignification reaction in soda cooking or low sulphidity kraft liquors.

Antiblocking Agents: Antisticking substances used to prevent the adherence of paper to itself and other materials. They are applied as a coating over the completed sheet or in the coating makeup operation.

Antichlor: Chemical substance used to remove residual bleaching chemical after the chlorination, hypochlorite, and chlorine dioxide bleaching operations in a pulp bleaching sequence. Sulphur dioxide (SO_2), sodium bisulphite (NaHSO_3), and sodium thiosulphate are some of the substances commonly used.

Anti Counterfeit Paper: A strong writing and printing paper treated with chemicals to expose any attempts of alterations of the writing thereon by ink eradicators, mechanical erasures, etc. The application of chemical ensures results in chemical change in paper and produces definite marks visible either with the naked eye or under ultra violet light. This type of

paper is used for printing lottery tickets, memo books or paper having any negotiable value (*see also* Anti Falsification Paper).

Anti Falsification Paper: A superior grade paper on which any printing, typing, writing, etc, cannot be fraudulently altered by eradicators mechanical erasures, etc, without noticeable affecting the surface design and/or uncovering or making otherwise visible a 'hidden warning'. This paper is usually used to make forms having a negotiable value, such as bank cheques, tickets, postal money orders, certificates, etc. Also referred to as safety type paper or anti-counterfeit paper.

Antifoam: A material which, when included in a liquid composition, retards or inhibits the development or foam.

NOTE — This is not the same as defoamer.

Antifoaming Agent: An additive which prevents, inhibits, or reduces the tendency of a liquid to foam. *See also* Defoamer.

Antimony Oxide: A nonopaquing, low-reflectance synergist that permits the formulation of deeper, darker colours with less pigment in paper. When used with halogens it acts as a flame-retardant in paper, plastic, and textile production.

Antioxidants: Agents which retard the action of oxygen in ink-drying oils and other substances subject to oxidation.

Antique Board: A board made with a rough-finished surface design resulting from large, long, and narrow hill-and valley-type felt marks, randomly aligned and not running in the machine direction.

Antique Finish: A type of rough paper and paper board surface finish design, primarily the result of felt marks. To produce this effect, wet press felts with long naps are run with little pressure, followed by the use of low pressure on the machine calender.

Antique Glazed Paper: A paper which has a smooth, gloss finish on one side and an antique finish on the other.

Antique Paper: Printing paper having good bulk and opacity with rough or matt surface.

Anti Rust Paper: Paper in which have been incorporated certain substances which give it the property of protecting the surfaces of ferrous metals against rust.

Antistatic Agents: Substances that eliminate or reduce static electricity on paper. These agents can be incorporated in the paper or applied to the surface, in either case the purpose being to prevent the paper from attracting 'dust' particles or other sheets of paper.

Anti Tarnish Paper: Paper in which certain substances have been incorporated to made it capable

of protecting bright metallic surfaces against tarnishing when wrapped with this paper.

Apparent Density of Paper or Board: It is the mass per unit volume of paper or board obtained by dividing the grammage of the paper or board, expressed in g/m^2 , by its caliper, expressed in microns (0.001 mm). It is the reciprocal of bulk.

Appearance: The visual characteristics of paper, taken as whole. Elements of appearance include colour hue and intensity, brightness, whiteness, finish, cleanliness and similar other visible characteristics.

Appearance of Paper: The effect upon the sense of sight resulting from observation of the colour, brightness, finish, cleanliness, formation and other visible characteristics of paper or board.

Applicator Roll: The roll on a reverse roll coater which runs in reverse direction to the web travel and applies the coating onto the sheet.

Approach Flow: The portion of stock slurry flow in a fourdrinier paper machine from the discharge of the fan pump to the slice. On a cylinder machine, it refers to the portion of stock flow from discharge of the mixing box or centrifugal screen to the board making or conventional vats, or to the entrance of the web forming zone.

Approach Flow System: The system of approach flow, covering all equipment between the fan pump and the slice of the headbox. This includes pipeline, cleaners, screens, distributor, and headbox. The system delivers and transforms the stock as uniformly as possible and eliminates flow disturbances. On a cylinder machine, it includes the pipeline, flow distributor, nozzles and mixing chamber. It proportions stock to the mixing chamber feed nozzles and mixes it before passing it on to the forming zone.

Appurtenances: Machinery, appliances, and auxiliary structures attached to a main structure, but not considered an integral part thereof, for the purpose of enabling it to function.

Apron: Originally an oil cloth attached to the head box and extending over the fourdrinier wire from the breast roll to the bottom slice and up on the sides to the deckle strap. This arrangement allowed the stock to flow over the apron and then on to the wire. The slice on top lip of the nozzle would meter the flow against the apron to the fourdrinier wire. Modern head boxes employ a rigid metallic plate as apron attached to it usually has its down stream edge at the breast roll centre line and with a clearance of approximately 1/16" above the wire. The metal apron which is usually of stainless steel extended from between the slide plates of the down stream part of the head box. Metal apron are made adjustable in the machine direction so as to control water drainage at the point the paper stock

contacts the moving wire. With stationary metal apron this may be accomplished by adjusting the slice lip, which controls the flow against the apron to the fourdrinier wire.

Aqueous: A term used to refer to pulp and paper making materials made from with or by water-like pulp stock slurries, chemicals, dyes, additives, etc.

Aragonite: A crystal-type calcium carbonate paper coating pigment which provides high opacity and covering power.

Arching: A common problem with pulp, chips, and other material in storage bins in pulp and paper mills when the formation of an arch or bridge prevents flow through the bottom opening(s) to the discharge mechanism. The arch is normally broken up by means of poking, vibrating, agitating, or blasts of air or stream. Also known as bridging.

Archival Paper: Paper having a high resistance to ageing intended to be used for documents which have to be stored for a long time.

Armature Paper: A very tough and durable hump fibre paper made up of very long fibres with the appearance and strength characteristics similar to vellum. It was first made in Japan and now used primarily for insulation in electrical armatures.

Arsenical Paper: As its name implies, a paper containing arsenic. Formerly used in wallpaper and flypaper.

Art Board: It is a coated board, manufactured either by coating a pulp board on both sides with a material containing adhesives, kaolin, etc., or by lamination of two chrome sheets (coated on one side) with the help of an adhesive so that the board is suitable for fine screen half-tone work.

Art Cover: A special decorative cover paper, used for announcements, greetings, valentine cards, and the like.

Art Paper: Paper coated on both sides with material containing adhesive, kaolin, etc., to give a surface suitable for fine screen half tone work or sophisticated printing. Generally Art paper possesses high finish and smoothness and gloss.

Art Poster Board: A rigid board made of several layers. It is lined on one or both sides with white or coloured paper and used for advertising posters, show cards, campaign posters, article display advertising, game cutouts, etc. Also referred to as art board.

Articulating Paper: A paper used by dentists to determine and adjust the 'bite' of human teeth. It is impregnated with a relatively soft vegetable wax to receive and 'record' bite information. Nontoxic colourants contained in the wax are easily transferred to teeth and various synthetic dental materials.

Artificial Leather Paper: The base paper used in the manufacture of artificial leather and made from a variety of pulp, rag or furnishes in grammage ranging from 100 to 400 gsm or more. It may contain a rubber latex applied either prior to or after sheet formation or may be a saturating paper intended for impregnation with a latex composition.

Arto Type Printing: *See* Collotype Printing.

Asbestine: A fibrous magnesium silicate mineral paper filler having physical properties similar to both talc and asbestos. A principal use is in blotting-type papers and some boards. Also referred to as agalite.

Asbestos: White asbestos (Chrysolite) is a naturally occurring fibrous crystalline magnesium silicate. It occurs in various combinations as white, greyish, or green veins of smooth non-tubular fibres which may be separated readily by mechanical treatment. It has fair acid and good heat resistance. In addition to the white variety, blue asbestos (crocidolite) and brown asbestos (amosite) are used by the industry.

Asbestos Board: Board composed only of asbestos fibres or mixed with binder or filler. It is characterised by a low degree of combustibility.

Asbestos Cement Board: A pressure-formed, fire-resistant board made from a mixture of asbestos fibres and cement, or other suitable materials and used to manufacture building materials. Some times called asbestos lumber.

Asbestos Diaphragm Paper: A type of paper containing high quality asbestos fibres that is used generally to make electrolytic cell separation membranes or diaphragms.

Asbestos Electrical Insulation Paper: (a) An inorganic base paper made of specially processed white asbestos fibres in thickness of 0.076 mm to 0.230 mm. The paper may be treated with plastics and/or laminated to improve its mechanical properties. This paper is used for heat-resistant electrical insulations for the higher temperature ranges. (b) A paper made of specially processed white asbestos fibres combined with certain organic fillers to improve its mechanical strength in thicknesses of (0.005 to 0.015 inch) 0.127 mm to 0.380 mm. This paper is used primarily as a heat-resistant electrical insulation in combination with other dielectrics.

Asbestos Fibre: Fibre material made from white asbestos, a naturally occurring fibrous crystalline magnesium silicate. It possesses good heat-resistant properties and is used in the composition of paper, boards and felts requiring this characteristic.

Asbestos Paper: A sheet of asbestos fibres, from 0.380 mm to 1.587 mm (0.001 5 to 0.062 5 inch) thick. For special purposes it may be laminated to greater thicknesses. The furnish consists mainly of asbestos fibre of varying qualities, depending upon the use to

which the paper is to be put. A small amount of sizing is usually used but sometimes the amount of sizing and filler may be as great as approximately 15 percent in papers for special uses. Asbestos paper is used as an insulating material where minimum thickness is required, principally as a protection against heat and as a fire retardant between floors, walls, and ceilings.

Asbestos Waterproofing Felt: A thick, strong asbestos felt saturated with asphalt and used in the construction industry for long-lasting waterproofing.

Ash: The inorganic residue obtained after complete combustion of cellulosic materials, such as wood, pulp and paper. It is measure of the mineral salts and other inorganic matter.

Ash Content: The percentage of ash resulting from the complete combustion of a specific sample weight of cellulosic material, such as wood, pulp, and paper, in which all carbon, combustibles, and volatile compounds are removed. It is an indication of the amount of mineral salts and inorganic matter in wood straw, etc, and pulp. It is also an indication of inorganic matter in the filler, coating, pigmentation and chemical additive content in a paper sheet.

Ash Free: A descriptive term applied to pulp, paper, board, and other cellulosic materials prepared and treated in such a way that essentially no ash is produced when all combustible and volatile compounds are removed by complete combustion. *See* Ash Less Paper.

Ashless Filter Paper: Filter paper, used in laboratories for analytical work, that produces practically no ash on complete combustion, indicating that no fillers or additives have been used in its manufacture.

Ashless Paper: Paper leaves almost no residue after complete combustion. *See also* Ash Free Paper.

Asphalt: A mixture of hydrocarbons prepared from coal tars, made up into the form of emulsions, and used in the paper industry to manufacture roofing and other types of waterproof papers or felts.

Asphalt Laminated Paper: A multi-ply paper made with layers of asphalt, used in the construction of container industries or where a high-strength, water-resistant paper is required.

Asphalt Felt: A roofing felt saturated with asphalt. The percentage of asphalt saturant ranges from approximate 140 to 160 percent on the weight of the original dry felt. The principal uses of asphalt saturated felts are as sheathing papers under roof shingles and sidings and particularly in the construction of built up roof wherein several thickness are cemented to each other by mopping with hot asphalt.

Asphalt Paper: A general term which includes papers saturated, coated or laminated with asphalt or other bituminous material.

Assimilative Capacity: The capacity of a natural body of water to receive: (a) waste water without deleterious effects; (b) Toxic materials without damage to aquatic life or humans who consume the water; (c) BOD within prescribed dissolved oxygen limits.

Atlas Paper: A kind of map paper designed for atlas printing, and characterised by excellent lithographic printing quality.

Atmosphere: The ambient air outside and surrounding the manufacturing process, machinery and various plant facilities of a pulp and paper making unit.

Atmospheric Curl: The tendency of paper to take up a curl when standing in the atmosphere due to the difference of one side taking up and releasing moisture from the other side as the humidity changes.

Atmospheric Pressure: See Barometric Pressure.

Attapulgite Clay: A coating clay made up of complex hydrated aluminosilicate with clay minerals and 5-15 percent magnesium. The pigment is absorptive, and it is sometimes used in speciality coatings for reproduction papers.

Attenuator: A device to reduce steam temperature by mixing it with lower temperature steam or water, or by passing it through tubes immersed in the water of a boiler drum, generally by means of automatic control. Same as desuperheater.

Auto/Manual Control: A control or selector system (or selector action) which permits an operator to select either automatic or manual operation of an equipment at a location remote from the actual physical hardware, for example the operator may manually move a knob in the control room to change the position of a damper in an air duct a long distance away. The operator may also place the system station in automatic mode and permit the controller to position the damper as required to maintain proper control.

Autochrome Printing Paper: Coated paper suitable for multi colour printing.

Auto Guide Roll: A selected roll on a roll-driven machine which automatically adjusts its angle to align the web being driven so that it does not slide from side to side, preventing possible run off or damage. It is used specifically to guide felts and wires on paper machines. Also called automatic wire guide roll.

Autohydrolysis: The treatment of raw material with water or steam at high temperatures as commercially practiced in the first stage of cooking when manufacturing dissolving pulp.

Automatic Controller: A device or combination of devices which measures the value of a variable quantity, load, or condition, and operator so as to

correct or limit deviation of the controlled variable from a preselected reference.

Automatic Control System: An operable arrangement of one or more automatic controllers along with their associated equipment connected in loops with one or more processes.

Automatic Trip: The automatic opening (other than manually) or a circuit breaker due to changes in current or voltage, or other electrical conditions.

Automatic Starter: A motor starter designed to automatically control the acceleration of a motor.

Automatic Switch: A remote control device for controlling signal circuits.

Automatic Wood Charging: The feeding of wood logs to certain types of grinders, such as magazine and chain grinders, automatically from conveyors running above the top of a row of grinder magazines, as contrasted to manually loading logs in other types of log grinder.

Automatic Wire Guide Roll: A selected fourdrinier wet end wire drive roll which automatically adjusts its angle to maintain alignment of the wire to minimize side to side movement and prevent possible damage or runoff.

Automation: The act or method of making the pulp and paper manufacturing process or system perform with a minimum of operator intervention or supervision. The common word designating the state of being automatic where machinery is applied to perform and control all operations in the mill automatically and continuously.

Atomizer: Equipment used to produce a fine spray of material so it can be directed to a designated area, such as the spraying of atomized water on the surface of paper on the calender of the paper machine to improve finish. Spraying of atomised steam adjusts the caliper or thickness of the paper.

Automobile Board: A paper board used in automobile body construction, largely as panels, either plain, embossed, coated, decorated or to be covered with fabrics. It is generally made of chemical pulp, reclaimed paper stock or combination of both on a cylinder machine or on one of the recent developed former-type machines. Caliper ranges from 1 to 12 mm. This board is rigid, resistant to blows to abuse and to penetration of water and other liquids. It does not soften at high temperatures. Asphalt and resins are commonly used as the waterproofing agents.

Automobile Seat Cover: A fabric made from yarn that consists of twisted narrow slit paper produced from bleached and/or unbleached sulphate pulp. The fabric is used extensively in the automobile industry for trunk linings and rugs. Also referred to as automobile trunk lining and twisting paper.

Automobile Trunk Lining of Twisting Paper: See automobile seat cover.

Automobile Tyre Wrap: MF, MG or WF foundrinier or cylinder mould kraft paper which is dry or water finished and may sometime be decorated with various trade-marks or designs. It may also be duplex, one side of which is coloured. It is cut in strips approximately $2\frac{1}{2}$ inch (65 mm) wide and available in small rolls to be used with automatic tyre-wrapping machines for wrapping tyres to protect the rubber from deterioration by actinic rays and to protect the tyres from mechanical injury during shipment or storage. Strength, and resistance to abrasion are important properties and the colours should be fast to light.

Auto Slice: A type of slice on a paper machine, provided with an automatic operator, that can be adjusted automatically as well as manually from a remotely generated signal. Sometimes a handwheel is also incorporated so that the slice can be hand-operated in case of malfunction of the automatic operator.

Autotype Paper: A bond or writing paper similar to Register Bond. It is usually made from chemical pulps in grammage of 34 to 60 gsm and is characterized by a smooth printing surface and good manifolding qualities. It is used for multi-copy automatic register applications.

Available Chlorine: A term used in rating chlorinated lime, hypochlorites, chlorine dioxide, and other chlorine derived chemicals (usually used in water treatment and pulp bleaching operations) as to their total oxidizing power.

Axial Flow Pump: A type of pump where the flow of material enters along the centre axis of the impeller and is discharged from the outer peripheral of vanes. Also referred to as a centrifugal pump.

Azo Compounds: Chemical compounds from which synthetic organic pigment dyes are synthesized.

Azo Dyes: Synthetic organic pigment dyes normally employed in colouring or tinting aqueous mineral coatings. Sometimes referred to as azoic dyestuffs.

Azoic Dye Stuff: See Azo Dyes.

Azure Wove Paper: A paper without laid lines usually bluish green in colour having a good writing surface.

Aniline Dyes: Currently a broad range of synthetic organic dyes and pigments, so named because of such dyes originally made from aniline derived from coal tar. They are classified according to the degree of brilliance that is tinctorial value and fastness to light for example basic dyes which have extreme brightness, but are not fast to light, acid dyes which are less

brilliant, but are faster to light, and direct dyes which have the least brilliance, but are fastest to light.

Aniline Printing: A rotary letter press printing process using ink made of aniline dyes and pigments (mixed with a binder) that dries primarily by evaporation due to the solvent vehicle (with rapid evaporation properties) used. The process is generally used for printing on media such as paper, paper board, laminations films, and foils. It is commonly known as flexographic printing because of the rubber plates and rolls employed in the process.

Attrition Mills: Grinding or shredding machines used to split or break chips into splinter for the manufacture of structural boards.

Azure Laid Paper: A paper with laid lines usually bluish green or light blue in colour having a good writing surface.

Anchoring: The process of attaching pulp and paper making equipment to the floor or other mounting base such as fastening with anchor bolts.

B

B : (a) A mark indicating a degree of roughness in the finish of super-fine drawing papers. 'B' is rough and 'B.B' is double rough. (b) a designation used frequently in connection with groundwood papers to denote grades in which the pulp content is wholly unbleached.

B.B. Note Papers: (a) Paper used in the manufacture of blank books, writings, bonds, ledgers, book or lower grades may be used, provided they have good writing qualities. (b) An abbreviation for black-bordered note papers.

B.F. Ratio: The quotient of the bursting strength (expressed in gramforce per square centimetre) and the substance of the paper or board (expressed in grams per square metre). It is burst factor if the substance is oven dry basis. See Burst Factor.

Babbitt Bearing: Bearing on pulp and papermaking machinery that is lined with babbitt, an alloy containing tin, copper and antimony.

Baby Dryer: A small diameter drying cylinder located in the dry end section of a paper machine.

Baby Presses: Low pressure presses on a cylinder board machine. They are located before the normal press section. Also referred to as primary presses.

Back: (a) The side of inferior quality ply in multi-ply boards made up of different stocks the side better quality of finish is referred to as 'top'. (b) The drive side of a paper machine.

Back End: That portion of a paper machine following the dryer section where the winders, rewinding reels, slitters, and calenders are located.

Back Fall: The section behind the roll in a beater over which the roll discharges the stock after it passes beneath it.

Back Flow: Any reverse flow of liquid in a pipe line or stream such as occurs in backwashing filters and screens.

Back Linning: *See* Bogus Paper.

Back Mark: Ridges on loft-dried sheets of paper caused when they are suspended on poles or lines during the air drying process. Also referred to as pole mark or stick mark.

Back Pressure: The pressure at any point in a flow system that results from conditions downstream from that particular point. In the paper industry, it is generally considered as the exhaust pressure in any of the unit processes.

Back Pressure Evaporator: A type of evaporator used to concentrate pulp mill wash liquor before it goes to a multiple-effect evaporators. It gives best economy in cases where there is a steady use for low-pressure steam, and is commonly used to concentrate pulp liquors.

Back Tender: A member of the paper mill machine crew responsible for the operation of equipment such as winders, rewinders, reels, slitters and calanders located at the back end of the paper machine.

Back Water: All waters of a paper mill separated from the paper stock or pulp suspension, either from the paper machine or accessory equipment, such as thickeners, washers and save alls and also from pulp grinders. It carries a certain amount of fibre and may contain varying amounts of fillers, dyestuffs, etc.

Backing Away from Fountain: In the printing industry an ink that does not flow up to the fountain roller is said to 'Back away' causing too little and uneven inking. This is due to ink lacking tack and flow.

Backing Board: A thick paperboard placed in the backs of mirrors, pictures, etc, or used for partitions in furniture. It is generally made on a cylinder machine of paper stock, is pasted or unpasted and is rigid to prevent warping. It may be lined or coloured on one side to give the desired finish.

Backing Paper: (a) A paper that strengthens the flong or mold of alternated sheets. It is used as mold for stereotype work; pastes down easily; and is usually brown. (b) An unprinted hanging paper sometimes used on a wall before the printed hanging paper is applied.

Backing Roll: A large diameter roll or cylinder which is an integral part of the one-side application roll coater and the inverted or puddle type trailing blade coater. On the one-sided application roll coater a metered quantity of coating colour is applied by the applicator roll as the web of paper passes between it and the backing roll. On the inverted or paddle type, excess

coating is removed from the surface of the paper by a blade which is positioned against the paper web while in contact with the backing roll.

Backing Wire: Heavy woven mesh screen stretched over the winding wire of the cylinder mould of a cylinder mould machine.

Backoff Water: Pressurized water used to move the pressure foot of a pulp grinder back to the position where the magazine can be loaded with logs.

Backwashing: The operation of cleaning a rapid sand or mechanical filter by reversing the flow of water or liquid that is being filtered.

Bacteria: Microorganisms, especially present in the aqueous phase of paper coatings, whose excess activity and growth cause deterioration or spoilage of paper coating formulations and ingredients giving bad odour.

Bacterial Count: A laboratory test procedure consisting of numerical evaluation of the amount of bacterial organisms in a specific sample weight of paper, board or any material used in its manufacture, which grows under the conducted test conditions.

Bactericides: Chemical substances added to paper pulp slurries, coating formulations, water, and other paper making materials to inhibit the growth of undesirable bacteria. *See* Biocides.

Bad Bleach: A deinking mill term referring to a bad printed wastepaper cook in which the ink is not acted upon and the sizing is not thoroughly saponified.

Bad Core Start: A general reference to imperfections in a reel of paper resulting from undesirable conditions such as loose winding, poor edge alignment, corrugations, etc, occurring during the beginning of the winding, operation and located near the core. Also called poor core start.

Badami Paper: Cheap, hard side paper of nutbrown colour usually containing waste paper in the furnish.

Baffle Aerator: An aerator wherein baffles are provided to cause turbulence and minimize short-circuiting.

Baffle Board: Wooden type dams and plates used in the headbox of a paper and board machine to prevent flocculation and eddy currents. It promotes good mixing and velocity control.

Baffles: Plates placed perpendicular to the flow to change the direction of a flow medium. Also, a system of dams and plates in a paper machine headbox.

Bag: A flexible container made of paper, foil, plastic film or the like in one of four general types; flat, square, satchel-bottom, or automatic (self opening); the term duplex is used when two layers of paper are employed and multiwall when three or more walls are employed.

Bag Paper: Paper used in the manufacture of bags or sacks with the choice of paper dependent upon the quality and quantity of the product intended to be packaged and subsequent bag filling operation, handling, transporting and storage requirements. Examples of bag papers and their intended end-uses are: (a) Grocery bag and grocery sack paper — unbleached or bleached kraft paper varying in grammage with lighter weights used for grocery bags and heavier weights used for grocery sacks. (b) Multiwall kraft paper-unbleached, semibleached, coloured or bleached kraft paper having high strength characteristics specified in relation to the ability of the paper and finished bag to perform its heavy duty packaging functions.

Bag Sealing Machines: Equipment used in a bag mill to seal ends of paper bags. It is also used in automatic bag milling operation to seal the open end of bags after filling.

Bagasse: The crushed residue of the stalks of sugar cane after the juice has been extracted.

Bagasse Paper: Paper made from the bagasse pulp.

Bagasse Pulp: Pulp made from the residuals of sugarcane, called bagasse after the sugar has been extracted from it.

Bagginess: A defective characteristic of a paper sheet having fullness in the centre due to high moisture content. Sometimes referred to as baggy.

Bagging: The forming of the characteristic of fullness of a paper sheet or bagginess. It will cause crackling and puckering if the coated sheet is not dried slowly.

Bagging Machine: Equipment used in bag mills that automatically converts paper into bags. Also a machine that automatically fills and seals bags.

Baggy: See Bagginess.

Baggy Paper: A defective web with nonuniform draw, sometimes caused by a localized high moisture content. The web width does not uniformly support web tension. There are tight and slack sections across the width of the sheet. If severe enough, it results in web tension difficulty in subsequent operations. Sometimes referred to as baggy end, slack areas, slack centre, and slack end, denoting the position of the defect across the face of the roll.

Bakelite Paper: A hard sheet made by saturating soft paper with a resin, which is then polymerized to a Bakelite-like material by drying, curing, and pressing under high temperature and pressure. Sometimes referred to as hard paper.

Bakers Wrap: A lightweight wrapping paper used for wrapping baked goods. It is usually made from bleached chemical pulps. It may be either machine finished or machine glazed, the large percentage being the latter. Significant properties include a reasonable

strength, a high finish, a good white colour and in most cases, a machine-mark stripe.

Balance Sheet: The resin-saturated layer of paper in a laminated sheet which minimizes warping by maintaining uniform stresses throughout the multi-ply composite.

Bale: A large, closely pressed, square-or rectangular-shaped package of rags, wastepaper, pulp, and paper of standard sizes. Bale dimensions and weights vary with the type of contents, grades of paper packaged, and type of press used.

Baled Pulp: Pulp that has been dried and put in bundles weighing 200 to 250 kg and measuring approximately 75 cm × 75 cm × 75 cm.

Baling: (a) Forming a bale of pulp, rags, waste paper, or other materials by compression in a baling press and banding with straps of metal or other material. (b) A method of packing paper, in which the paper is covered with burlap, baled under pressure, and protected on opposite sides by boards; metal bands are then fastened around the bale.

Baling Paper: A general term applied to any heavy paper used for covering bales to protect the contents. It may be reinforced with cloth fabric (cheese cloth) which is pasted to one side after it has been coated with asphalt, or it may be crinkled, corrugated, or treated with asphalt.

Baling Press: A type of pulp compaction machine used to press flashdried fluff pulp into cakes, which are combined and repressed into bales, or they may be originally compressed into bales. Also, a machine used to compress pulp, rags, wastepaper, and other materials into bales.

Baling Wire: Metallic binding used to secure pulp sheet and other wrapping around baled pulp.

Ball Bearing: A ball type antifriction bearing employed in various locations in the pulp and paper mill to provide low resistance to turning.

Ball Valve: A type of valve commonly used on pulp stock lines, having a plug that is a rotary-motion operated sphere with ports of different shapes, the most common being the V-port, eccentric, and straight-through port.

Balloon Paper: A well-sized, nonporous, pinhole-paper made especially for hot-air balloons.

Bamboo: A giant woody grass, often reaching a height of 13 m or more found in the tropical and sub-tropical regions of the earth. Its fibres have an average length of 2.4 mm, thus standing between soft wood and hardwood fibres. There are several hundred species of bamboo found in Tropical and Subtropical forests of the world.

Bamboo Paper: Paper made primarily from pulp stock derived from the cooking and treatment of bamboo.

Bamboo Pulp: Pulp obtained from bamboo stems.

Band Conveyor: A type of conveyor using a continuous rubber belt.

Band Mill: A plant where thick and big wood logs are sawn into small sizes for chipping.

Band Saw: A continuous, vertical belt-type saw used in a band mill.

Band Stock: A paper made of chemical or mechanical pulp used for banding bolts of cloth or some cloth products. It has good strength characteristics and printability.

Bank: An electrical term referring to an assembly of fixed contacts engaged by the moving members of a selector. Banks are usually multiple.

Bank Paper: High-grade writing paper made of cotton and/or bleached chemical pulp with good characteristics and durability.

Banker (Shape) Envelope: A flat case, rectangular in shape and generally made from one sheet of paper. This sheet is so folded as to provide a plain front and a back consisting of four over-lapping flaps. Generally three flaps (but occasionally only two) are stuck together, the fourth, which may be gummed or ungummed serving as a closure. This fourth flap may be either on the long side (banker shape) or on the short size (pocket shape) of the rectangle. The front and/or back of the envelope or pocket may have one or more transparent windows.

Banknote Paper: A durable security and safety paper suitable for multi-colour printing and having a high resistance to handling and folding (*see also* 'Currency paper').

Bar Angle: (a) The angle at which bars of a beater roll are aligned as they pass bars in the beater bedplate. (b) The angle of bars in respect of each other in the opposing members of a stock refiner.

Bar Pressure: The pressure between bars in the beater roll and bed plate as related to the applied load and to the effective average areas of the bars in mutual contact.

Bar Screen: A mechanical cleaning device used at the inlet of a pulp and paper mill open water supply (lake or river) or in effluent treatment plant to remove debris from the water or mill effluent before being pumped into the treatment area.

Bar Width: The distance across the face of the bars in a beater or stock refiner.

Bar-fibre Action: The mechanical action imparted on fibre as it passes between opposing sets of bars in a beater or stock refiner.

Barber Drying: A method of air drying, where the moist paper, after tub sizing, is passed over a series of driven carrier rolls arranged in two tiers, one placed 1.3 to 2 m above the other so that the sheet travels successively in approximately vertical passes alternately over an upper tier rolls and then down around a bottom tier rolls and back up to the next top roll, etc. The drier mechanism for these rolls is arranged to allow control of tension on the sheet as it is dried by heated air blown over the moving sheet. This treatment imparts a cockle finish to bond papers. It is so called from the name of the inventor.

Barium Carbonate: A chemical compound (BaCO_3) obtained either from the naturally occurring mineral, witherite or by chemical reaction and used as a coating pigment, usually in combination with other pigments.

Barium Sulphate: A chemical compound (BaSO_4) obtained either from the natural minerals barytes or by chemical reaction and used as a filler, and as a coating pigment especially for photographic papers either alone or in combination with other pigments. The artificial product is called blancfixo, fast white, pearl white, or permanent white.

Bark: The outer covering of woody stems or roots of plants and trees. Bark is composed of inner living bark and outer dead bark. Bark is composed of resinous, gummy and lignious matter with certain percentage of fibres. It is not used as a source of paper making fibres because of its difficult pulping properties. It is usually removed from roundwood plant stems and burned or processed into mulch.

Bark Boiler: A furnace designed especially to burn as a fuel to generate steam.

Bark Disposal: After removal from logs, the bark put for burning in a power boiler or using landfill, etc.

Bark Flume: A V-shaped, constructed waterway used to transport bark removed from wood in the wood preparation area of a pulp mill to the bark preparation plant situated close to the boiler house.

Bark Press: A machine used to apply mechanical compression to bark removed from wood during its reclamation for burning. It achieves a dryness of at least 40 percent in the bark.

Bark Reclaiming: Putting back the bark removed from wood to some useful purpose rather than treating it as a waste material. The most common use is to burn it in a power boiler to produce steam.

Bark Specks: Bark specks in paper caused by bark fragments in the pulp.

Barker: Equipment used to remove bark from logs prior to further preparation and use in the manufacture of pulp.

Barker Cutter Head: A wood cleaning machine that removes bark from slabwood with the use of concave

knives set in the face of a rotating, concave roll. Also known as a planer head barker.

Barking: The operation of removing bark from pulpwood prior to chipping, screening, etc. This is carried out by means of a knife (disk) drum abrasion, hydraulic barker, or by chemical means.

Barking Drum: A large, horizontally inclined, rotating metal drum equipped with internal steel bars into which pulp wood logs are conveyed to remove bark by mechanical abrasion as they tumble against each other and the inner surface of the drum.

Barometric Condenser: A process unit used on black liquor evaporators to create a vacuum by means of a steam-jet air ejector or a dry vacuum pump.

Barometric Leg: A large pipe connected to the centre of the cylindrical drum on vacuum filter and dropped some distance below into a filtrate tank. This then will create a vacuum for the filter by falling filtrate, thus aiding sheet formation on the wire cloth-covered vacuum filter drum.

Barometric Pressure: Pressure exerted by the earth's atmosphere. At sea level, it is 14.7 psi or 76 cm of mercury absolute or 101.325 pascals, the value decreasing with increasing altitude. Also referred to as atmospheric pressure.

Barrel Liner: A vegetable parchment or a specially wax-treated, moistureproof paper used as the inner lining for barrels to provide leakproof retention and maintain freshness of contents. It is also used as a barrier to odour, dust and other objectionable materials.

Barrier: A term used in the paper industry that refers to specially prepared products that provide resistance to the passage of moisture, vapour, gases, water, oil, and other liquids.

Barrier Paper: Paper that is specially treated, coated, or laminated to provide resistance to the passage of moisture, vapour, gasses oils, water and other liquids. Also called barrier sheet.

Barring: The cyclic variations in caliper as measured in the machine direction of a finished sheet of paper.

Barring Amplitude: The mean difference between the maxima and minima of machine direction cycle variations in caliper of a finished sheet of paper over a one-second run of a length of paper on a paper machine.

Bars: Paper sheet imperfections appearing as uniform parallel undulations running along the machine direction, also called buckles, chain marks, rope marks ridges and sometimes referred to as corrugation marks. It also refers to metal members fitted on the surface of beater rolls and bed-plates and on refiner plates which mechanically treat the pulp passing between them during the beating/refining operation.

Bartel Truck: Equipment for transporting paper in rolls using spindle in-core at one end of the roll and clamps to hold the side of the roll.

Baryta Paper: A paper coated with barium sulphate to give a smooth, low gloss surface. It is used chiefly as a base for photographic emulsions, and therefore contains no material injurious to them.

Baryte: Natural mineral ore from which paper coating and filler, barium sulphate (BaSO_4) is derived. Also referred to as barite, baryta and heavy spar.

Base Alum: $\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O}$ or $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$. or a mixture of these hydrates. A papermaking chemical commonly used for precipitating the rosin size onto pulp fibres to impart water-resistant properties to paper. *See also* Alum.

Base Paper: Same as 'Body Paper'.

Base Speed: The lowest speed obtainable at rated load and voltage and at normal operating temperature, of adjustable-speed motors used in pulp and paper mills.

Base Stock: Paper or board to be further treated in various ways. Also called body stock.

Basewab Paper: Paper used in the manufacture of shotgun cartridges. It is located in the base, and holds and seals the paper tube to the brass wall.

Basic Colours: High-brightness, low fastness paper colour obtained by the use of basic dyes. *See* Basic Dyes.

Basic Dyes: A class of insoluble colouring materials derived from aniline and commonly used in the form of dispersed pigment for tinting white papers. These materials are also converted into water soluble sodium salts in which form they are used for colouring various grades of paper where light fastness is not an important consideration. Basic dyes are also used in oil soluble or spirit soluble forms for such products as hectograph inks, typewriter ribbons, carbon paper coatings, stamp pad inks, etc. Soluble basic dyes have more affinity to unbleached pulps than bleached pulps.

Basic Dye Stuffs: *See* 'Basic Dyes'.

Basic Size: All sizes of trimmed papers accepted by National standards and paper trade.

Basis Mass: Same as 'Substance' or 'Grammage'.

Basis Weight: The basis weight of paper or board is expressed in grams per square meter (grammage).

Bast Fibres: Fibres obtained from the inner bark or phloem of a woody plant. Examples of bast fibre plants harvested annually and used in paper making are flax, hemp, jute, kenaf and mitsumata.

Bast Paper: Paper made from pulp consisting of bast fibre like kenaf, jute, hemp, ramie, etc.

Batch: A specified quantity of materials required for complete one operation in the pulp and paper making process. Also, an operation in the pulp and paper

making process which is carried to completion on this specific amount before proceeding to the next specified quantity.

Batch Blending: Mixing predetermined amounts of stocks, additives, dyes, and chemicals to produce paper of specified qualities in a stepwise operation, as opposed to a continuous operation.

Batch Chlorinator: A vessel used to mix specified amounts of chlorine and pulp so that the chlorination process can be carried out to completion before processing another specific quantity.

Batch Continuous System: In stock preparation, an arrangement of batch pulpers and continuous refiners and jordan.

Batch Cycling Chest: A storage chest in a batch pulping system into which batch pulpers are dumped. The batch of reduced pulp is held and cycled to refiners until refined to the desired degree. Two cycling chests are normally used, thus the second is discharging and filling while the first is cycling through the refiners.

Batch Digester: A cooking vessel, usually pressurized in which predetermined, specific amounts of raw material and cooking liquors are heated and the conversion of raw material to pulp is completed. After removal of pulp only, the cycle repeats. This is in contrast to a continuous digester.

Batch Process: A unit process in the manufacture of pulp and paper that is carried out to completion on specified quantities of process materials before repeating the cycle.

Batch System: A pulp and paper manufacturing unit process consisting of a series of operating units which processes predetermined specific amounts of materials and carried the process to completion before starting another cycle.

Battery Paper: A paper used between the plates of storage batteries to absorb excess moisture from the paste which is used in making such plates. It may be made of reclaimed paper stock, chemical or mechanical pulps, or even rags. The paper is made on a fourdrinier machine, with a very rough finish requiring practically no calendering.

Bauer McNett Classifier: A test equipment having several compartments fixed with series of different mesh size used to determine pulp fractions having different fibre length distribution in a pulp stock. Also referred to as Bauer McNett fractionator.

Baume Hydrometer: A float fitted with a scale graduated in units called Baume. Used to measure specific gravity (but referred to as density) of liquids and slurries such as black, white and green liquors, and line and clay slurries.

Baume Test: A test to determine the density of liquids and slurries using a float-type hydrometer to arrive at the specific gravity Baume value.

Beading: The operation of forming the edges of paper or board into a tight roll as for reinforcing the lips of some drinking cups.

Beaming Board/Paper: A high-strength, heavy-duty, water-finished paper or paperboard used as a wrapping material, and made from chemical pulps. It also has been used by the textile industry for winding silk stands on the beam just before the weaving operation.

Bearing: A machinery part in which a journal, gudgeon, pivot, or pin turns or rotates.

Bearing Housing: The metal protective covering over a machine bearing, which also serves as an anchor to a firm base.

Beatability: The degree of response to beating by pulp to impart certain physical properties to it.

Beater: A machine consisting of a tank or 'tub' usually with a partition, or 'midfeather' and containing a heavy roll revolving against a bedplate. Both rolls and bedplate may contain horizontal metal bars set on edge. The primary function of the beater is to initiate the development of the fibre by cutting, bruising, fibrillating and hydrating action on the fibres. Fillers, dyestuff and sizing materials may or may not be added to the beater and thus incorporated with the paper stock. Sometimes also referred to as Hollander Beater.

Beater Additive: Any nonfibrous material such as a colouring or sizing agent, gum or synthetic resins added to the furnish to improve the processing and final properties of the paper. *See* 'Additives'.

Beater Adhesive: Additive mixed with pulp stock in the beater to enhance strength properties of the final sheet which will be formed from it. *See* 'Adhesive'.

Beater Bars: Metal bars or blades fitted on the peripheral surface of the beater roll just above the bedplate, between which the pulp mass circulates and is mechanically treated. Also called 'Beater Knives'.

Beater Chest: A storage chest located under a beater in which the beaten pulp is dumped after mechanical action is completed. It acts as storage of pulp.

Beater Drives: Mechanical means of rotating the roll in a beater, and can be either steam turbine-or electric motor-driven.

Beater Dyeing: A paper colouring method by which dyes or pigments are added to the fibres in the beater or at any stage in the preparation of the furnish up to the headbox, as opposed to surface colouring after the sheet has been formed.

Beater Filling: *See* 'Beater Loading'.

Beater Furnish: The materials, such as pulps, dyes, and additives, that are put into a beater for mixing and mechanical treatment.

Beater Knives: Same as Beater Bars action to the pulp slurry in the beater vat when the roll is turned. Also called 'Beater Bars' or 'Beater Blades'.

Beater Loading: (a) The process of adding a filler to the stock in the beater or to the pulp furnish prior to sheet formation. (b) The operation of adding pulp, pigment, etc., to the beater.

Beater Sizing: The process of sizing paper by the application of sizing materials in the beater, or to the furnish prior to sheet formation, as distinguished from surface sizing or tub sizing. It usually refers to the use of rosin size and alum, but other sizing agents may be used. It is also called as Engine Sizing or Internal Sizing.

Beater Tackle: That part of the beater that has to do with the drive, roll, and its appurtenances, excluding the beater tub or vat.

Beating: It is the process of the pulp refining operation carried out in the beater. Also called refining.

Beating Degree: The extent to which a stock furnish must achieve a definite refining character by beating in a beater. Also called beatability.

Beating Effects: The specific properties and characteristics attained by the paper sheet as a result of beating the pulp stock.

Beating Rate: The speed at which specified physical characteristics, such as freeness, bursting strength, tensile strength, tear, etc., are achieved in the beating process of the pulp.

Beating Time: The time that pulp takes to achieve a particular freeness degree in beating operation in a test beater.

Beaverboard: Any rigid-type wallboards. It once was a trade name for a laminated type of building wood pulp board.

Bed Knife: Metal bars located on the surface of the bedplate. The beater roll knives or bars roll over the bedplate surface and apply mechanical action on the pulp in the beater vat when the roll is turned.

Bed Load: The amount of pressure that must be applied to the beater roll to get a specific desired contact pressure between the roll and the bedplate of the beater.

Bed-Fired Furnace: A type of incinerator in which solid fuel is used and burned in a pile formed by feeding the fuel to the floor of the unit called a grate.

Bedstead-Wrapping Paper: A kraft paper of average strength, in grammage of 49 g/m², and heavier, used for wrapping beds to protect the paint and finish from damage in transit.

Bellmer Bleacher: A specially shaped concrete and tile-lined tub with a worm or screw propeller mounted at one end, used to mix bleach solutions and pulp at 5 percent to 7 percent consistency in a single-stage,

batch-type pulp bleaching process. Some times referred to as a bellmer chest.

Bells: See 'Bubbles'.

Belt Conveyor: A means of transporting materials such as chips, coal, etc., in a pulp and paper mill. It consists of a continuous belt which rides on rollers and is motor-driven. Sometimes called a band conveyor when the belt is made of rubber.

Belt Drive: A means of transmitting power and mechanical rotary motion from source such as an electric motor, turbines, etc., to a piece of machinery by use of a flexible belt. A common means used to drive paper machine sections.

Belt Filter: A rotary, cylinder-type vacuum filter using a drum-driven belt screen to separate solids from the liquids.

Belt Shifter: A mechanism used on a belt drive to move the belt to various-sized driving rolls to change the speed or stop the rolls.

Bend: (a) A mechanical distortion of paper such as would result from being tightly wrapped around a small core. (b) A crease in a sheet of paper.

Bend Quality: The characteristic of paperboard to withstand many bends before fatigue or damage occurs at the crease.

Bentonite: A naturally occurring clay mineral (also called montmorillonite) which has high absorptive and colloidal properties. Bentonites are used as paper filler, pitch dispersants and in speciality coatings.

Beta Meter or Beta Gauge: An instrument that uses beta ray-emitting, radioactive isotope to make the primary measurement of a process variable. It is commonly used to measure the weight of the sheet of paper (basis weight) as it is being made on the paper machine. It is also used to measure density and level of liquids, solid, and other paper making materials. Sometimes also called Beta-ray gauge.

Beta-Cellulose: The portion of cellulosic material that dissolves in the alkaline solution under the conditions of the alpha-cellulose determination, but which is re-precipitated on acidification of the alkaline solution.

Bevelled Gear: A type of engaging wheel in any paper making machinery where the teeth run at an angle rather than straight across the face of the wheel.

Bevelled Gear Drive: Any mechanical-driving mechanism whose power is transmitted through a bevelled gear.

Bewoid Mill: Equipment used in the bewoid process.

Bewoid Process: The preparation of rosin in dispersed from using a small amount of case-in dissolved in alkali as a dispersing agent.

Bewoid Size: A dispersed form of rosin size prepared by the bewoid process.

Bible Paper: A lightweight paper with sufficient opacity, designed for the printing of bibles, missals, encyclopedias, rare books and the like. It is normally made from bleached chemical pulps, and/or cotton fibres. Low bulk, high opacity, permanency and durability are important qualities. Opacity is provided through heavy loading with titanium dioxide and/or other pigments. The paper is also called India Bible, India Oxford Bible, or Cambridge Bible especially in England where it was first developed.

Biffar Screen: A centrifugal-type screen used to remove dirt and other suspended impurities in pulp stock.

Bill Straps: A general term applied to strips of kraft, manila, bond or ledger paper used to fasten, currency notes into packets. The strips may be coloured and printed to denote different denominations of bills; they are usually gummed on one end.

Billhead Paper: A bond or writing paper used for the printing of bills statements and the like where handwritten or typewritten entries are made. It is generally made from chemical pulps.

Billing Machine Paper: A ledger- type paper made of chemical pulps and designed for accounting machine use. It is characterised by a smooth printing surface and good physical strength.

Billy Stick: A wooden stick sometimes used by a back-tender to evaluate the operation of a paper machine in a mill. The roll of paper is hit with the stick to obtain an indication of the hardness by the sound produced and thereby if the paper roll is tight or loose at certain places.

Bin: Storage container for chips in a pulp mill with sloped of conical bottom. Main storage is accomplished in large stationary bins, while individual digesters are gravity-fed with chips from bins located above them. Some mills feed digesters from main storage by means of a belt conveyor.

Binder: A material used to cause substances to bond or adhere. In the paper industry, binders are used widely to cause fibres to bond, coatings to adhere, or as laminates for binding two or more sheets of paper or board.

Binders Board: A single-ply solid board used principally for the binding of books. It is made on a wet machine from a base stock of mixed papers and is tunnel or platen dried. Important properties are smoothness, uniformity, high density, stiffness, and strength. It should be free of objectionable odours.

Binding Agent: A chemical or material used to promote the adherence of fibre to fibre, additives to fibres, coating to papers.

Binding Paper: A one-sided, water-activated, adhesive-coated paper made from chemical pulp that is cut into narrow rolls to make binding tape for sealing bundles, cartons, and other packages.

Binding Power: The ability of materials used in the paper industry to cause substances such as fibres, coatings, and laminates to adhere.

Biochemical Oxygen Demand (BOD): The quantity of oxygen used in the biochemical oxidation of organic matter in a specified time, at a specified temperature, and under specified conditions. (b) A standard test used in assessing waste water characteristics.

Biocides: Chemical agents with the capacity to kill biological life forms; bactericides, insecticides, pesticides, etc, are examples.

Biodegradable: Any organic material which is capable of being converted by certain bacteria into basic elements of compounds, such as carbondioxide and water. Most paper products are considered to be biodegradable.

Biological Conversion or Control: The transformation of industrial and municipal organic wastes by micro-organisms. Such wastes are subsequently treated chemically to prevent pollution of the receiving waters.

Biological Effluent Treatment: Process in which living microorganisms are mixed with incoming waste to a paper mill waste treatment plant and use the biologically degradable organic in waste as food-stuffs or an energy source, thus effectively removing them from applied waste-water.

Biological Oxygen Demand (BOD₅): The amount of dissolved oxygen consumed in 5 days by biological processes breaking down organic matter in mill effluent.

Biomass: Total amount of forest wood (all growth), coal, etc, used as fuel for power boilers to produce steam to generate energy, heat and electricity.

Biplex: Paper or board consisting of two furnish layers combined together during manufacture, while still moist, without the use of adhesive.

Birch Pulp: A hardwood pulp made from the cooking of birch wood chips.

Birefringence: A phenomenon associated with the starch granule wherein it produces dark cross patterns by refraction when exposed to polymerized light.

Bisulphite Chemi-Mechanical Pulp (BCMP): A type of pulp made by pretreating chips with bisulphite cooking liquor with no free sulphur dioxide prior to subjecting it to stages of atmospheric refining for final mechanical separation of the fibres.

Bisulphite Process: The pulping process in which the cooking liquor used contains a predominance of bisulfite ion in the 2 to 6 pH range with little or no free

free SO_2 . The pulping is accomplished at elevated temperature and pressure. Calcium base liquors were first used, but non sodium and magnesium based liquors are more common today. Also called 'Acid Process of Pulping'.

Bisulphite Pulp: Pulp made by the bisulfite process.

Bisulphites: Cooking liquors whose chemical makeup contains the bisulfite radical derived from the sulphur dioxide used in its preparation. The most common bisulphites are calcium, ammonia, magnesium and sodium bisulfite.

Bite: The surface grain of paper, especially drawing paper, caused by paper machine wire wove marks of the underside, the felt fabric impressions of the top side and the slight surface depressions existing in the sheet fibres. The roughness is an indication of the ability of the paper to accept crayon and pencil application. Also called tooth.

Bitumen: Base material used for making asphalt containing emulsions that internally size darkcoloured stocks used for making paper and boards. It is also used for making asphalt-containing coatings.

Bitumen Coating Machine: Equipment used to apply layer of asphalt-containing coating on one or both sides of paper and board.

Bitumen Pasting Machine: Equipment used to apply a layer of asphalt-containing coating between two sheets of paper or board.

Bituminous Emulsion: Asphalt-containing emulsions that internally size dark-coloured stocks used for making paper and boards such as boxboard, structural board, and water resistant specialties where colour is not a factor.

Bituminous Paper/Board: Paper or paper board made from stocks that have been internally sized with an asphalt type emulsion.

Black: (a) The terms applied to a body: A perfectly black body is a body which absorbs all incident light and reflects none. By extension, a body which unselectively at an extremely high proportion of all radiations sent upon it such as a cavity lined with a near-black material and receiving the incidence through a small aperture. (b) The term applied to the field of vision absolute luminous sensation because the stimulus is below threshold of sensitivity of the eye.

Black Album Paper: A fairly heavy cover-type, antique finish paper used for the manufacture of photographic albums. It is heavily dyed in a dead black shade and is usually made of chemical and/or mechanical pulps. It is characterized by good punching and folding qualities, fairly hard sizing to resist the cooking effects of paste, and freedom from any impurities which might affect photographic prints.

Black Ash: The combustion product discharged from a rotary-type recovery furnace or roaster resulting from the burning of concentrated black liquor. It contains sodium compounds and large amount of unburned carbon.

Black Body: In the appearance evaluation of paper, it refers to a thermal radiator of uniform temperature whose radiant existence in all part of the spectrum is the maximum obtainable from any thermal radiator at the same temperature (The designation 'Black body' is appropriate because such a body will absorb all incident radiant flux). It does not in any way indicate the colour of the body.

Black Centered Board: A stiff resilient coated board usually laminated in two or more plies to make it more opaque. Other important characteristics are high gloss, smoothness, stiffness and uniform caliper. It is used for making playing cards where opacity, good shuffling property, stiffness and effortless sliding property are important requirement.

Black Cook: The result of cooking wood by the sulphite process, which produces darkened pulp due to overheating or raising to maximum temperature too fast. Also called burnt cook.

Black Line Paper: A chemically treated paper, similar to blue-print paper, in which the developed design appears as black lines on a white background.

Black Liquor: The spent liquid obtained from the pulp-washing system. The composition varies considerably in different mills and from different methods of cooking. It is distinctly alkaline, but not caustic. It has an intense black colour and contains spent chemicals and lignin compounds and other organic matter removed from the raw material during the process of cooking.

Black Liquor Burning: The incineration of concentrated black liquor in a specially designed furnace in order to recover spent cooking chemicals and to produce steam and power.

Black Liquor Density: The concentration of organic matter in black liquor which is important for combustion in the recovery furnace.

Black Liquor Disperser: A device used in a recovery mill to diffuse agglomerated solids and saltcake in the black liquor just ahead of the liquor firing guns on a sulphate chemical recovery furnace.

Black Liquor Evaporation: The process of concentrating black liquor to such a density that, when sprayed into a recovery furnace, it will ignite and continue to burn because of the organic matter it contains.

Black Liquor Evaporators: Multiply-effect combination of steam pressure and vacuum vessels in which black liquor is concentrated. They are arranged

in such a way as to minimize the amount of steam used to carry on the process of water evaporation.

Black Liquor Feed: Concentrated black liquor which is pumped into the spray nozzles of a black liquor recovery furnace.

Black Liquor Gasification: The slow oxidation of the organic carbon in spray particles of the black liquor stream from the liquor guns or burners in a chemical recovery furnace.

Black Liquor Handling System: Pumps, pipelines, and holding tanks used during the transportation of black liquor from the brownstock washers, through the evaporators, and to the recovery furnace.

Black Liquor Oxidation (BLO): The transformation of unstable sulphur compounds to the more stable sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$) in black liquor by the use of air or oxygen (O_2) so that objectionable hydrogen sulphide (H_2S) and organic sulphur compounds formation in its evaporation and combustion stages are minimized, thus preventing their loss from the sulphate recovery process. The treated liquid is called oxidized black liquor. This process obviously helps in reducing pollution in air as well as in waste water.

Black Liquor Pyrolysis: A process occurring to the black liquor spray particles from sulphate chemical recovery furnace feed guns or burners. It involves chemical changes in solid sulphur salts with the result that the sulphur is released to the gas phase as hydrogen sulphide (H_2S) due to the intense heat encountered. Some gasification of organic carbon also occurs with the major gasifying agents being CO_2 , H_2O and O_2 in the furnace gases.

Black Liquor Recovery Boiler: A boiler designed specially to recover heat and inorganic cooking chemicals by burning concentrated black liquor (from the cooking of raw material by the sulphate or soda process). The heat is used for steam generation and the inorganic chemicals are recovered and recycled in the pulping process.

Black Liquor Recovery Furnace: A furnace or combustion chamber especially designed to recover spent chemicals by burning concentrated spent black liquor from the cooking of raw material by the sulphate process.

Black Photo Paper: A paper which is used to protect or wrap sensitized photographic materials. It must be free from pinholes and from chemicals or other materials harmful to a photographic emulsion.

Black Waterproof Paper: A high sheathing and insulating paper manufactured from strong jute or kraft paper stock, saturated and coated with special asphalts. It is used as an insulator under roofings, sheathings, and under or between floors.

Black Wrapping Paper: A wrapping paper, made of sulphate, jute, or kraft pulp or a combination thereof. It is used in a wide range of grammage for wrapping and decorative purposes. For photographic purposes it is lightproof.

Blackened Paper: Defective, transparent paper caused by crushing in the calender such that fibres in the sheet are pressed so closely together that the number of light rays reflecting surfaces decreases appreciably.

Blackening: A lowering of opacity of paper as the result of poor formation, too much moisture, and curshing caused by too much pressure used during the calendering operation. It produces a darkening effect on the sheet.

Blacks: A class of papers, it pertains to high-strength, black-coloured paper put to a wide range of special uses, such as lightproof wrapping in photography, covers, packaging, etc.

Blade: A thin, flexible, metallic plate used on paper machine rolls to scrape any adhering materials off the surface of rolls on paper machines such as calenders and pulp washers.

Blade Coater: A paper coating machine that uses a flexible metallic blade to spread coating material on the web of paper after it has been applied by a dip roll. Also referred to as flexible coater or a trailing blade coater.

Blade Coating: A method of coating paper utilizing a flexible blade set at an adjustable angle against a web of paper or board supported by a soft, usually rubber-covered backing roll. Also called training blade coating and flexible blade coating.

Blade Cut: A sharp cut (or near cut) running in a straight line, parallel to the direction of web travel. It is a defect of paper roll.

Blanc Fixe: A barium sulphate paper filler chemically produced by the action of a sulphate on a barium salt. Also called fast white, pearl white, or permanent white.

Blanket: A flexible material that can readily be conformed to curved or irregular surface. In printing, the rubberized or plastic-coated fabric covering a roller from which ink is transferred to paper or other substrate in any offset printing process.

Blanket Smash: A defect in the blanket resulting from irreversible compression of the blanket caused by foreign matter or by excessive thickness of paper or other substrate passing through the press.

Blanking Paper: A plain, uncoated poster paper (q.v.) used for covering or as a border for billboards. It has the same characteristics as poster paper, except that printing or lithographic qualities are not essential.

Blanks: A term applied to a class of paperboard ranging in thickness from 0.305 mm to 1.981 mm

(0.012 to 0.078 of an inch). They may be either single ply fourdrinier board, multi-ply cylinder board or laminations of these. The liner may be made of deinked stock, clean shavings, bleached or unbleached groundwood, or chemical pulps. The surface may be either coated or uncoated, white or coloured. Blanks are generally made to produce maximum stiffness and surface smoothness. They are used for various purposes where stiffness and good printing qualities are required as in bus and subway signs, window displays, etc.

Blasting Paper: A paper used by miners for lining a drilled hole or for enclosing black powder or other explosives. It is a high machine or water-finished sheet, usually specified in heavy weights. This paper is made from chemical pulps or hemp. It is impregnated with wax or oil to produce a high water resistance.

Bleach: An oxidizing or reducing agent used to remove colour from pulp so that it has a higher brightness.

Bleach Demand: The amount of bleaching chemical required to achieve a certain level of brightness in the bleaching of pulp, carried out under specified conditions. It is a measure of how easy or hard it is to bleach the pulp in a bleaching process. It is usually stated in terms of chlorine equivalent.

Bleach Liquor: A term once commonly used to refer to calcium hypochlorite $\text{Ca}(\text{OCl})_2$ chemical solution in the bleaching of pulp, but now also refers to solutions of other bleaching agents such as sodium hypochlorite (NaOCl) Chlorine dioxide (ClO_2), etc.

Bleach Mixer: A piece of process machinery used to mix bleaching chemical usually hypochlorite, with pulp during the bleaching process.

Bleach Plant: That part of a pulp mill where the bleaching process is performed. It usually adjoins the brownstock washing operation but sometimes is contained in a separate building. Occasionally, this area is referred to as bleachery plant. It also refers to the area where hypochlorite bleach solutions are prepared.

Bleach Requirement: The amount of bleaching agent, expressed in terms of available chlorine, required to produce a specified brightness in a pulp.

Bleach Resistant Papers: Coloured papers containing dyestuffs of colouring materials which are resistant to decolorization by common bleaching agents, ink eradicators, etc.

Bleach Scale: A pearly, light-brown, brittle spot in paper, caused by insoluble bleach residues.

Bleach Sludge: The settling or dregs left after chlorine is bubbled and mixed thoroughly with limewater to produce bleach liquor (which is decanted from top of the reaction tank).

Bleach Tower: A tall, cylindrical retention chest where pulp, mixed with the bleaching agent, is retained for the required time for the bleaching action to be completed in a continuous system of pulp bleaching. An up-flow type is used when bleaching low consistency pulp, and a downflow-type is used when bleaching medium and higher consistency pulp. Also referred to as bleaching tower.

Bleach Tub: A vessel used to mix pulp and chemical bleaching agents and to retain them for the specified period of time for the bleaching action to be completed in a batch system of bleaching pulp.

Bleach Washer: A filter (washer) located after a bleach tower in the bleaching sequence of pulp where the pulp is washed free of the residual bleaching agent and the products of the bleaching action.

Bleachability: Capacity of a pulp to be bleached to a given whiteness approximately and indirectly related to lignin content. Common tests used to determine bleaching are permanganate number (κ or K number), hypo number and roe chlorination number. They indicate the quantity of bleach in terms available chlorine that will be required in the bleaching process and serve as a guide and control for the cooking process.

Bleachable Pulp: Pulp which has the capability of being purified or whitened by chemical treatment to remove or change colouring matter so that it will achieve a higher brightness characteristic.

Bleached Board: A general term covering any board (q.v.) fourdrinier or cylinder, which is composed of 100 percent bleached fibre (q.v.).

Bleached Kraft (Paper): Paper made from bleached kraft pulp.

Bleached Packaging Paper Board: A paper board (q.v.) made from a furnish of approximately 85 percent virgin bleached chemical pulp.

Bleached Pulp: Pulp that has been purified or whitened by chemical treatment to alter colouring matter and has taken on a higher brightness characteristic.

Bleached Specimen: A specimen whose light absorption has been decreased by chemical or radiant means.

Bleacher: A vessel used to mix pulp and chemical bleaching agent and retain them for a specified period of time for complete bleaching action in a one-step process of bleaching pulp.

Bleaching: The process of chemically treating pulp fibres to reduce or remove colouring matter so that the pulp is improved in terms of whiteness of brightness. Chemicals used for bleaching are Calcium/Sodium hypochlorite, Chlorine dioxide, Gaseous chlorine, Hydrogen peroxide for chemical grade pulps and Zinc

hydrosulphite, SO_2 and H_2O_2 for semichemical and mechanical grade pulps.

Bleaching Agent: A variety of chemicals used in the bleaching of wood pulp such as chlorine (Cl_2), Sodium hypochlorite (NaOCl), Calcium hypochlorite ($\text{Ca}(\text{OCl})_2$), Chlorine dioxide (ClO_2), Peroxide (H_2O_2), Sodium chlorite (NaClO_2), oxygen (O_2), and others. Also referred to as bleaching chemicals.

Bleaching Effluent: Liquid discharge from a pulp bleaching process which contains chemicals and other contaminants considered a source of pollution if allowed to flow into natural water resources.

Bleaching Liquor: A solution of a colour-removing agent. The term is usually applied to calcium hypochlorite or sodium hypochlorite.

Bleaching Loss: The shrinkage in the quantity of pulp during bleaching reaction due to conversion of colouring compounds and chemical compounds into soluble compounds — which are washed out in the sub-sequent washing operation.

Bleaching Powder: Dry calcium hypochlorite. The quality of bleaching powder is calculated on the basis of a standard bleaching powder containing 35 percent by weight of available chlorine. It contains dry calcium hypochlorite — $\text{Ca}(\text{OCl})_2$, Calcium hydroxide $\text{Ca}(\text{OH})_2$ and moderate quantity of water. This is sometimes also called as Chloride of Lime (CaOCl_2).

Bleaching Sequence: The order in which bleaching chemicals are added. It determines the number and arrangement of stages used in a continuous system of bleaching pulp.

Bleaching Stage: One of the unit process operations in which one of the bleaching chemicals is added in the sequence of a continuous system of bleaching pulp.

Bleaching Time: The retention time or the time interval that it takes the pulp being bleached to pass through the entire bleaching process or a bleaching stage in the sequence of a continuous system of bleaching pulp.

Bleaching Yield: The percentage of bleached pulp left as compared to original quantity of pulp after reaction with bleaching chemicals and washing during the bleaching process. It is expressed as percentage of the O.D. weight of raw material used in the process.

Bleed: (a) To arrange for printed matter (usually illustration) to extent somewhat beyond the trim position of the page on one or more edges, to ensure that the edge of the illustration will be flush with the trimmed edge. (b) To cut into printed matter, either by plan or accident, when trimming printed sheets. (c) The illustration of page planned to bleed. (d) The printed trim from a bleed page.

Bleeding: (a) The dissolving out of colour from paper or pulp by water, oil, or other liquid. (b) Discoloration

of the surface of paper or board, or contiguous materials, by the migration of components of asphalt. (c) Staining of contiguous objects by coloured papers, generally in the presence of moisture. (d) An unfavourable characteristics of the machine wire or felt wherein due to higher open area than required, the film, fibres or chemicals pass through it during paper web passing over it, and accumulating on various machine rolls. This hinders the process of paper making affecting quality of paper.

Bleeding Fastness: The resistance of a dye to staining when the sheet comes in contact with water or other solvents. Such dyes are used in paper made for automobile seat-covers, and packaging for greasy foods.

Blend: A uniform material made by combining solutions or suspensions such as pulp stock slurry made from a variety of pulps, additives, dyes, and chemicals, etc, prepared for a particular variety of paper to be manufactured.

Blend Point: A phase of a blending operation in the paper making process where the combining solutions and suspensions are added to form uniform material.

Blender: An unit of machinery or system used for blending process.

Blending: The process of making a blend.

Blind Drilled Roll: A suction roll on a yankee tissue machine which dewater the wet web and transfers it from the felt to next stage of pressing or drying.

Blister: (a) An elevation of a part of the surface of the sheet, or of the surface ply, or of the coating, enclosing air or moisture vapour between the surface and the rest of the sheet. (b) A rapid test for papers such as glassine or greaseproof made from highly hydrated pulps; such papers develop blisters when exposed to the flame of a match or cigarette lighter just enough to char the sheet very slightly.

Blister Cut: A cut occurring when an excess of paper, caused by a full area in the web that has accumulated as a blister at the entrance of a nip in a calender stack, is carried through the nip in folded condition.

Block: A term sometimes used to refer to a piece of pulpwood before grinding. It also refers to an abrasive pulpstone segment used to dull another pulpstone.

Block Bin: A storage place for raw material.

Block Valve: Hand valve located in proper position with reference to automatic or relief valve so that they can be closed for maintenance on the automatic or relief valve. It is also referred to as Isolating valve.

Blocking: Adjacent paper and paperboard sheets in rolls or stacks sticking together because of pressure, temperature, high humidity conditions or faulty coating. It occurs in calenders and supercalenders, when paper adheres to the rolls and is called calender roll blocking.

Blocking Resistance: Ability of paper rolls and sheets to withstand the incidence of blocking.

Blotting Paper: An unsized and porous paper used wherever absorptivity is desired or where soft spongy paper is needed, even though the absorptivity is of secondary importance. It is made from rag, cotton linters, chemical or mechanical pulps or mixtures of these. The paper is porous, bulky, of low finish and possesses little strength. Some grades are made with a smooth machine finish, which makes them suitable for printing with coarse-screen halftones.

Blow: (a) The discharge of the contents of a digester into a blow tank after completion of the cooking operation. The pulp is blown out by the pressure inside the digester built up during cooking. (b) It also refers to the discharge of the oxygen reactor into the blow tank in the process of bleaching pulp with oxygen. (c) In a paperboard mill it designates blisters occurring between two layers of a multi-ply board made on a cylinder machine due to the lack of adhesion between plies.

Blow Back: (a) An operation used in a kraft batch pulping process to clean relief screens during a cook so that they will pass relief gases freely. It consists of closing the relief valve and opening a valve on a steam line, introducing steam between the closed relief valve and the screen, and thus blowing off any accumulated fibre back into the digester and cleaning the screen. (b) In a continuous digestors, sometimes stock/liquor/steam starts coming out from the feed side due to either faulty formation of plug of the raw material chips or due to high pressure built up in the digester like Pandy-a digester or Kamyr digester.

Blow Box: A device used in air drying of paper to provide support and a guide plane for the sheet. It is designed to keep the sheet from blowing away as drying air velocity is increased.

Blow Heat: The heat in the exhaust gases and steam released during the discharge of digester into a blow tank after the cooking process is complete.

Blow Heat Recovery: A process of recovering heat from the steam released while discharging a digester into a blow tank. It essentially consists of a combination of heat exchangers, cooling towers, pumps and storage tanks.

Blow Line Refining: Any mechanical action taking place or applied to the cooked fibre immediately after the digester and before the blow tank in the blow line.

Blow Liquor: The spent cooking liquor that drains from the blow pit after a completed digester cook is discharged into it. It is a common practice in the older type pulp mills.

Blow Off: (a) The operation of suddenly releasing pressure from a steam-generation boiler when it reaches a prescribed value. This is done automatically

by a quick-opening pressure relief valve. (b) The release of cooked pulp from batch-type digesters by the use of internal pressure.

Blow Out: The action of placing a small quantity of dyestuff on the point of a knife or spatula and gently blowing onto a piece of wet pulp or filter paper to check the dye being used.

Blow Pit: A large, round or elliptical tank into which digesters are discharged for storage and/or washing. It may also be a square or rectangular chest of wood or of concrete lined with wood, acid-resistant brick, or tile.

Blow Pit Wash: A method of washing cooked pulp in the blow pit by filling it with water after the cooking liquor is drawn off, permitting the water to drain off, then repeating this operation several times. The wash is finished by the use of high-pressure hoses.

Blow Point: The predetermined time to blow a digester either before during the cooking phase.

Blow Pressure: In the batch digester pulping process, it is the digester pressure at which the blow valve is opened to empty the digester.

Blow Roll: A roll located between the fourdrinier part of a paper machine and the felt press part under which the paper web passes as it travels from the suction couch roll to the lead felt roll.

Blow Tank: A storage tank in which cooked pulp is blown from digester and stored pulp is blown tangentially from a digester into a separator, with pulp dropping into the tank, and the steam and gases escaping from the top vent to a steam condenser or blow heat recovery system.

Blow Through Dryers: A type of paper machine dryer system where the flow of steam and condensate through the individual dryer section depends upon a drop in steam pressure between them. An ejector is usually used for evacuation of noncondensibles.

Blow-through Steam: The steam used to create a differential and flow between paper machine dryer sections to evacuate condensate formed during the paper drying process.

Blow Unit: A mechanical device by which a continuous digester discharges its contents into the blow line.

Blow Valve: A valve at the outlet of a digester which is opened to allow the contents to be discharged through the blow line into the blow tank. It is closed during the cooking cycle on batch-type digesters.

Blow Zone: That section of a downflow, vertical continuous digester below the point where hot liquor is extracted and replaced by cool liquor.

Blowback Valve: A valve in the blow back steam line on a kraft batch digester which must be opened when the relief line is closed to clean the relief screen so that

it will freely pass relief gases from the digester to the relief line.

Blowdown: (a) Drains from the power and recovery boilers and/or water wall headers to remove spent precipitated feedwater treatment chemicals. It may be periodic or continuous. (b) In the batch-sulphite process, the relief of gas and steam to lower the digester pressure from hold to the blow pressure in order to recover excess SO₂ at the end of the cook. Also called gasdown, pressure blowdown, or side relief.

Blower: Mechanical equipment such as an enclosed fan designed to blow large volumes of air in power and recovery boiler burner and draft operations. It is also used in drying process in the manufacture of pulp and paper.

Blowing: (a) A phenomenon caused by an accumulation of air between a sheet of paper and the felt ahead of the press nip on a paper machine. (b) The process of discharging the contents of a digester into a blow tank by the release of built-up pressure. (c) The process of discharging the oxygen reactor into the blow tank in the process of bleaching pulp with oxygen.

Blowing of Oxygen Bleaching Stage: The process of discharging the oxygen reactor into the blow tank using the vessel pressure in the operation of bleaching pulp with oxygen.

Blowing Time: Duration of the batch digester cooking process, from the opening of the blow valve till the digester is empty.

Blowline: A pipeline connecting a number of digesters to a common or a number of blow tanks. It is a means of conveying the pulp coming through the blow valve, when discharging after the cook is completed, to the blow tank.

Blows: See 'Bubbles'.

Blue Carpet Paper/Board: A paper or paperboard with heavily textured surface (honeycombed or bubbled) used as carpet lining or as wrapping/packing for delicate items. The cushioned texture is acquired by special forming rolls in the primary manufacturing stages of the product, which is made primarily of recycled fibres.

Blue Glass: A piece of dark blue glass on which a thin film of pulp slurry and water are placed for examination.

Blue Glass Test Method: A procedure of examining a slurry of pulp using a blue glass to look for imperfections such as flocs and bundles. Also called 'Blue Glass Test'.

Blue Laid: A superfine writing paper with laid mark and coloured blue. Originally used in considerable quantities in legal departments.

Blue Reflectance Factor (Brightness): The terms 'Directional blue reflectance factor' and 'Diffuse blue reflectance factor (ISO Brightness)' refer to measurement of spectral reflectance factor for white and near-white materials in the violet and blue portions of the spectrum.

NOTE — The use of the term 'Brightness' without qualification is deprecated since confusion with 'luminous reflectance factor' and 'whiteness' is likely to arise.

Blue Rosin Sheathing Paper: A blue, well-sized, hardfinished sheathing paper made of wastepaper on a cylinder machine. It is used to protect against wind, dust, moisture, and water, in locations such as under sidings, between floors, linings of walls, and linings of boxcars.

Blue Tracing Paper: A tracing paper having a blue colour.

Blue Print Base Paper: A highly-sized and well formed paper used for making blueprint paper. It has excellent surface characteristics and good wet strength with uniform surface absorbency. This paper contains no chemicals to react with the sensitized coating, and will not shrink or warp when moistened. Also called 'Dyeline paper'.

Blueprint Paper: A paper produced from the blueprint base paper by treatment with chemicals, such as potassium ferricyanide and iron salts, such as the oxalates and tartrates. When developed, the light exposed areas turn blue. On an ordinary print there are white lines on a blue background. In some cases a negative is made from the original line drawing by making a brownprint, in which the lines are white on a black or brown background. The brownprint or negative is then used as a subject in blue printing and finally blue print has blue lines on a white background. This paper is used to make copies or reproductions of drawings and documents.

Board (Paper Board): A generic term applied to certain types of paper (see 'Paper') frequently characterised by their relatively high rigidity.

NOTES

1 In the generic sense the name 'paper' may be used to describe both paper and board as defined (see 'paper' and 'board')

2 For some purposes, materials of grammage less than 180 g/m² are considered to be paper, and materials of grammage of 180 g/m² or above, are considered to be board.

Board and Box Lining: (a) A grade of groundwood paper generally containing 65 to 75 percent of mechanical wood pulp with the balance usually unbleached chemical pulp, though occasionally bleached chemical pulp is used. Its principal use is in covering chip-board before manufacture into inexpensive setup boxes. Cleanliness and sufficient sizing for good pasting qualities are its important properties. (b) A general term for papers used for the same purpose including a free sheet and plain or coated book papers, particularly when printing is employed.

Board Converting Machine: Mechanical equipment designed to automatically convert paperboard into useable items such as boxes and cartons.

Board for Pressing: Board specially prepared for forming, by pressing between dies, a substantially three-dimensional article, namely the bottom or lid of a box.

Board Machine: A machine used to manufacture board and paper boards. The most common types are the cylinder mould and fourdrinier types.

Board Mill: That portion of a paperboard mill where the actual board is formed, dried, and prepared for further use.

Bobbin Fibre: A grade of vulcanized fibre used to manufacture textile bobbin heads. They are soft enough to resist edge denting in use, with the capability of being machined to a very smooth finish.

BOD Load: BOD content, usually expressed in kgs. per unit of time of waste water passing into a waste treatment system or to a body of water.

Body Paper: Paper or Board for conversion by coating (*see* 'Coating') or surface application or impregnation. In certain countries this term is also used for papers to which a layer of other material (aluminium, plastics, etc) is to be added (*see also* 'Base Paper').

Body Stock: The base stock or coating raw stock for plain or decorated coated papers and boards. It may be uncoated or precoated on the paper machine. It is also used in connection with industrial papers before they are treated. On account of the wide range which body stock may cover and also on account of the fact that it is usually made to order under special specifications, it cannot be described as containing certain amounts of any particular kind of pulp nor is there any way of referring to weights and colours. It is also termed as base paper.

Body Wrap: Paper and/or board, especially prepared to be used for moisture resistant paper roll wrapping. It is used to protect the roll from damage and distortion of the paper due to gain or loss of moisture from the surrounding atmosphere. It usually includes body wrap, heads, and bands. Often referred to as a wrapper.

Bogus: Refers to a product that has been made from wastepaper or other inferior stock to imitate higher quality grades. The term is applied to many different types of paper and board falling into this category.

Bogus Bristol: A bristol board usually made on a cylinder machine. It may be solid, or different stocks may be used for the filler and liners. The furnish consists of overissues news, blank news, bleached sulphite, soft white shavings, and hard white shavings in varying amounts, according to the quantity being made. One or both liners or the entire board may be

white or coloured. If coloured, the liners are usually either calender stained or tinted in the beaters. When used for various ticket purposes, the term 'ticket bristol' or 'coloured ticket bristol' is applied to coloured bogus bristols. Coloured bristols usually have an overissue news or chip fillers. It is sometimes called B bristol.

Bogus Drawing Paper: A paper of good texture and with sufficient tooth to take charcoal, soft pencil, crayon or water colours quickly. It is sized and finished slightly but without gloss and it is made from 100 percent reclaimed paper stock on a cylinder mould or fourdrinier machine.

Bogus Manila: A paper used to replace sulphite or kraft manila paper when strength and quality are not essential. It is commonly made from reclaimed paper stock and coloured to imitate manila.

Bogus Paper: A paper that is used for the same purposes as book back liner (q.v.) but which is made of paper of inferior strength.

Bogus Saturating Paper: A term applied to those bogus paper which are prepared as a vehicle to carry and hold various tars or asphalt compounds.

Bogus Wrapping: An absorbent and bulky wrapping paper made from waste-paper stock. Screenings or chemical pulp are sometimes added in small percentages. The paper may be finished and dyed to resemble unbleached wrapping paper. It is used where strength requirements are not high and in some paper making countries where virgin fibre furnish is too costly.

Boiler: A board or general term for a steam-generating unit. It is referred to as an industrial boiler when primarily used to generate steam for process requirements such as in a pulp and paper mill, or as a recovery boiler when used in the chemical recovery cycle of a pulp mill. Also used to generate steam for paper generation.

Boiler Blackout: The loss of chemical reduction in the smelt bed of a sulphate recovery furnace due to the lack of sufficient energy being produced from the combustion reaction to sustain it. This is caused primarily by a decrease in black liquor feed density below a prescribed minimum for the particular burner nozzle design, usually accompanied by a loss of flame.

Boiler Blowdown: *See* 'Blow Down'.

Boiler Drum: A feedwater storage vessel located at the upper end of the evaporator section of a boiler. At the last stage of feedwater heating by direct contact with steam from the evaporator section, the sub-cooled feed water is heated to saturation. Mechanical separation or vapour and liquid takes place here.

Boiler Efficiency: The ratio of the heat absorbed in the boiler to the heat supplied by the fuel. It can be calculated by taking the total heat value in KJ

produced in the steam in the boiler and dividing by the total heat value in KJ in the fuel inputs, and is expressed in percentage.

Boiler Feed Pump: The pump which supplies high-pressure feed-water to the drum of the power or recovery boiler. The pump is usually driven by a turbine or a motor.

Boiler Feed Water: Adequately treated water pumped under pressure to a boiler.

Boiler Tubes: Steel tubes that make up the evaporator section of a steam generator. They are arranged so that they connect two steel drums on upper and lower ends or are along the walls of a power or recovery boiler. Hot gases heat the tubes on the way to the stack and evaporate the water they contain into steam.

Boiler Water Treatment: The chemical conditioning of boiler feedwater to soften it and made it less corrosive to the boiler tubes and prevent scale formation inside the boiler tubes and drums.

Boiling Point (BP): The temperature at which water is converted into saturated steam at a specified pressure in the evaporation section of a boiler.

Bond Paper: Generally a superior quality of writing paper with good finish and strength with a water mark and substance of 50 g/m² and above. Originally a cotton-content writing or printing paper designed for the printing of bonds, legal documents, etc, and distinguished by superior strength, performance, and durability. Typical properties include erasability, whiteness, cleanliness, freedom from fuzz, uniform finish and good formation. Bond paper can be in light attractive colours also.

Bond Strength: The intralayer binding force in a multiply paper board or laminate. The term also refers to the degree of adherence of coating and film on a sheet surface and to the interfibre binding force within a sheet which provides resistance to lifting or picking of its fibres on the surface. Also called Bonding Strength.

Bonded Area: Term used to designate the external surface area of the fibre in a sheet of paper involved in the interfibre bonding.

Bonding: The sticking together of paper making fibres which provides toughness and strength to the paper.

Bonding Agent: A material added to stock that will increase the strength of paper made from it by increasing the cohesion force between the fibres.

Bonding Strength: The force with which fibres adhere to each other within a sheet, or with which a coating or film adheres to the surface of a sheet, or with which plies in a paperboard or laminated sheet adhere to each other. See 'Bond Strength'.

Bone Dry (B.D.): (a) A descriptive term for the moisture-free conditions of pulp and paper or any

fibrous raw material. Also called Oven Dry (OD). (b) Refers to air containing absolutely no vapour.

Bone Dry Weight: Moisture-free weight of materials. Also called oven dry (OD) weight.

Bone Fibre: A type of fibre made from chemically gelled cotton or alphaswood cellulose fibres. It is used for general and electrical purposes, but with characteristics of higher stiffness, hardness, and density than other types.

Bone Glue: A protein derived from animal bones, skins, sinews and tendons. It is used as a surface sizing agent for high-quality papers such as bank note, bond, etc.

Book Binding Board: Any board used as a component in making covers of bound books.

Book Board: A general reference to paperboards used in the book-binding industry to make front and back covers of hardbound books.

Book-cover Paper: (a) A white or coloured cover used for case-bond books. In this form it may be plain, pigment or plastic coated, embossed, decorated or otherwise embellished. It is generally made from chemical wood pulp in grammage ranging from 60 to 120 g/m². (b) Any paper used as a jacket for a case-bound book. (c) Any heavy kraft paper used as a protective covering for school and library books.

Book Fashion Inspection: A paper mill finishing room paper inspection and sorting procedure where a few centimetres (thickness) of a paper pile is checked at a time. One-half the area of one side of the sheet is inspected in a fan-like fashion and rolled back to its original position. Paper flags are inserted when defects are noted, and these sheets are removed when the accepted sheets are transferred to a new pile. This is also called 'Fly Finish'.

Book Mills: Converting plants that manufacture tablets, notebooks, memopads, and other types of writing, recording and bookkeeping ledgers from paper and paper board obtained from paper mills.

Book Paper: (a) A general term for a group of coated and uncoated papers (exclusive of newsprint) suitable for the graphic arts. Book papers are made from all types of virgin and reclaimed pulps and mixtures thereof. They are characterised by a wide variety of surface finishes (that is, antique, eggshell, machine, supercalendered, dull coated, matte-coated, glossy-coated, etc) with good formation, printability and cleanliness. (b) A generic term encompassing the above and related grades (for example, tablet, envelope, converting base, etc) which are made by so-called 'book paper mills'.

Book Paper (Coated): A coated printing paper designed for advertising purpose, magazines, books, pamphlets, brochures, and general printing applications. The base paper for this grade is generally made from virgin or reclaimed chemical wood pulps, or both and is then coated on or off the paper machine with various pigment formulations to provide brightness, opacity, printability, etc. Coated book paper is commonly supercalendered and its finish ranges from dull matte to high logs.

Book Paper (Uncoated): An uncoated printing paper designed for advertising matter, magazines, books, pamphlets, brochures and general printing applications. The term is also applied to tablet, envelops, converting papers and other grades made by so-called 'Book paper mills'. Book paper is generally made from virgin and/or reclaimed chemical pulps. It is characterised by a variety of finishes such as high bulk antique, eggshell, machine, supercalendered and embossed.

Book Wrapper: Usually a long-fibred paper either coated or uncoated, with good strength and printing surface, used as a jacket for a bound book. The term may also be applied to printed paper used as loose covers on hard bound books. It is also called book-cover paper.

Bookkeeping Machine Paper: Bond or ledger paper cut into form of single sheets suitable for use in bookkeeping machine.

Boom: A pocket formed by floating logs, with end touching end, during the process of hauling logs from a river into a log haul-up, ahead of a log slasher.

Booster: A generator inserted in series in a circuit to raise its voltage. A booster may be driven by an electric motor when it is termed a motor booster.

Borate A term used in reference to sodium borate ($\text{Na}_2\text{B}_4\text{O}_7$) from which borax is prepared. It is used with casein in the preparation of coating for paper and paper board.

Borax: A sodium-borate chemical compound used in dissolving casein when used in coating paper and paper board. *See also* 'Borate'.

Bored Rolls: Paper machine rolls that have been drilled with passages through which fluid heating or cooling medium is passed to control the surface temperature.

Borohydrides: Bleaching chemicals containing sodium borohydride (NaBH_4) used alone and with chlorine dioxide (ClO_2) to obtain very high brightness pulps.

Boss: A localised projection on the external surface of a pipeline, fitting, tank, or process vessel provided for the attachment of vents, drains measurement connections, or other accessories.

Bottle-cap Board: A sanitary food paperboard used in the form of circular disks for bottle stoppers. It is made of chemical or mechanical wood pulp or mixtures of these, hard sized and suitable for waterproofing by wax impregnation or barrier coating and has a surface adapted to colour printing. The normal thickness ranges from 1.0 to 1.2 mm (0.040 to 0.048 of an inch). Important properties are rigidity, uniformity in thickness, the quality of giving a clean edge when die-cut, and cleanliness.

Bottom Couch Roll: A hollow-drilled roll located under the fourdrinier wire at the press section end of the paper machine. It contains a suction box to aid in the removal of waste from the sheet, and is usually the main drive roll for the entire fourdrinier section.

Bottom Felt: The felts in a multifelt press section of paper machine that are located on the wire or bottom side of the paper and serve as a carrier of the sheet through the press.

Bottom Felt Press: The press through which the bottom felt and paper sheet are run in the press section of a paper machine. Also called Bottom Nip Press.

Bottom Press: *See* 'Bottom Felt Press'.

Bottom Press Roll: A rubber-covered, felt press roll which is located at the bottom-most location of the press and contacts it with applied pressure. Normally it contains suction boxes to improve water removal capacity.

Bottom Side: The wire side of a sheet of paper formed on a fourdrinier paper machine.

Bouguer's Law: In the appearance evaluation of paper, it states that equal layers will absorb equal fractions of radiant flux entering them.

Bound Water: The form in which hygroscopic water is present in a sheet of paper, such as mechanically and chemically bound to the fibres. Mechanically bound water exists within the fibre and fibre network spaces and adheres due to surface tension forces. Chemically bound water exists as a hydration bond with cellulose molecule in the fibre or other substances in the paper.

Bow Wave Finish: A type of finish that produces a two-toned, ripple-like appearance. It is caused by varying the thickness of a sheet, with thicker areas appearing lighter than the thinner areas, having a darker tone, obviously paper varies in caliper.

Bowed Rolls: Types of spreader rolls on a paper machine, especially designed and constructed with a bend to prevent wrinkle formation in a sheet. On some rolls, this bend is adjusted mechanically or by applying internal hydraulic pressure.

Bowl: Calender and supercalender rolls.

Bowl Glazing: Applying a high surface finish on paper during the calendering operation. This is

accomplished by passing the sheet through chilled metal rolls turning at different peripheral speeds.

Bowl Paper: A soft paper made from hemp, jute and rag stock, used in making up embossing machine and supercalender rolls.

Box Board: A general term designating the paper board used for fabricating boxes. It is a class of board frequently lined on one or both sides, with good folding properties and used for making boxes and cartons. It may be a simplex, duplex or triplex board.

Box Board Cutting: See 'Box Clippings'.

Box Clippings: A grade of reclaimed paper stock also called boxboard cuttings consisting of new cuttings of paperboard grades used in the manufacture of folding and setup boxes and similar boxboard products.

Box Liners: Papers used for the inside of boxes containing food or meat or crates containing celery, lettuce, or other vegetables to keep the products fresh through the retention of moisture and to protect the contents from dirt or other contaminations. Kraft paper, vegetables parchment, waxed paper and waterproof papers are the grades most frequently used, although other grades may be used for the purpose.

Box Machine: Equipment used to automatically cut, score, bend, and paste paper board together to form box containers.

Box Stay Tape: A tape used in reinforcing the edges and corners of setup boxes and corrugated cartons. The paper is made from kraft, hemp, etc. It is furnished in rolls of narrow width and often gummed, and it may be made in colours. The tape may be cloth-lined or laminated to glass fibre reinforcing strands.

Boxed Writings: A trade applied to 'Cut-size' (that is $8\frac{1}{2}'' \times 11''$, $8\frac{1}{2}'' \times 13''$ and $8\frac{1}{2}'' \times 14''$ or 216 mm \times 279 mm, 216 mm \times 330 mm and 216 mm \times 356 mm) bond, writing, onionskin and related papers packet in convenient 500 sheets boxes for office use. Also referred as boxed papers.

Bracket Trimmer: Paper cutting machine equipped with automatic spacers to trim paper.

Braille Printing Paper (or Braille Paper): Paper used in the braille process in which the paper is embossed to form a well organised pattern of raised dots which form characters of letters so that the blind may read by touch. Usually the paper is embossed or 'Printed' wet. Normally a good grade of chemical pulp is used in the manufacture of braille paper. Significant properties include smooth surface, good elongation and high tensile and burst strengths.

Brake: The mechanism on unwind and windup stands that will slow down the speeds of each as the size of the windup roll increases and the unwind roll decreases. The term also refers to other machine speed control mechanisms anywhere in the pulp and papermaking operation.

Braking: The process of controlling speeds of pulp and papermaking machines by retarding the motion or speed of the moving member.

Bread Wrappers: A paper used for wrapping bread, often loaded with materials, such as titanium dioxide, giving good opacity despite waxing. Two means are used, for supplying opacity to the sheet: namely beater filling and surface coating. It is sold in sheets to fit the bread loaf for hand wrapping, or in rolls for automatic wrapping machines. The wax forms a self-sealing wrapper.

Break: A term used to denote a complete rupture of a web of paper or paper board during manufacture or some subsequent operation which utilizes rolls of paper. Such breaks are generally spliced and marked by a protruding flag.

Break Detectors: Mechanical and optical devices located at strategic position on a paper machine in order to sense and alert the operator of any disruption of the paper web (break) during the machine operation.

Break Impulse: An impulse in the mill electrical system due to a temporary interruption of current.

Breaker: A beater like machine (engine) with or without a beedplate and with a roll fitted with blunt bars. It is used to breakdown sheets of the pulp or waste paper, broke, rags, rag pulp or other textile scraps into a pulp suspension. An arrangement for washing is generally incorporated.

Breaker Bars: Metal members mounted on the surface of the bed-plate and roll of a beater. They serve as a pulper to breakup dried sheets of pulp.

Breaker Roll: A roll that rides on a sheet of paper over the suction couch on the fourdrinier part of the paper machine when an open draw transfer is used. Sometimes referred to as a lump breaker roll or a presser roll.

Breaker Stack: Calenders located between coating operations, when more than one coat is applied, to smooth the paper following the base coat application.

Breaking: (a) Process of disintegrating mechanically, dry mill waste, old papers, dried pulps and lapped pulps to pulp form with enough suspension water to make it suitable for beating and/or refining and sufficiently free from bunches of sheets. (b) The cracking of the adhesive layer on gummed paper so that it will not bend when fed to the printing press.

Breaking Length: The length of a strip of paper or board usually expressed in meters, which would break of its own weight when suspended vertically. It is a value calculated from the tensile strength and the grammage of the sheet.

Breakpoint Chlorination: Addition of chlorine to water or wastewater until the chlorine demand has been satisfied and further additions result in a residual

that is directly proportional to the amount added beyond the breakpoint.

Breast Roll: A large-diameter roll around which the fourdrinier wire passes at the machine headbox just at or behind the point where the stock is admitted to the wire by the stock inlet. It is covered with corrosion-resistant metal or fibre glass and is usually driven by the fourdrinier wire.

Bridging: The arching of chips, pulp stock, etc, in a storage bin, usually located over the discharge opening or outlet device at the bottom. This impedes the movement or material, creating a discharging problem. It can also occur in other locations in storage bins.

Brightener: Fluorescent dye or pigment that absorbs ultraviolet radiation and re-emits blue light, thereby effecting a white appearance to a sheet of paper when added to the furnish stock. Also called optical whitener.

Brightness: The intrinsic reflectance factor measured at an effective wave-length of 457 nm with a reflectometer having specified characteristics. There are different types of instruments for this purpose and hence the degree of brightness has to be associated with the make of instrument. *See also* Blue Reflectance Factor.

Brightness Ceiling: The level of brightness of pulp which cannot be exceeded regardless of any quality of bleaching chemicals used or number of stages and combinations employed.

Brightness Drop: The percentage decrease in brightness of pulp, paper and paperboard due to ageing. Also called shade reversion or brightness reversion.

Brightness Meter: Any instrument used to measure brightness of pulp and paper.

Brightness Reversion: Loss of Brightness (q.v.) by bleached pulps, or by white papers and boards, during natural or artificial ageing. In a control laboratory the reversion test is carried out by exposing a sample of paper in an oven at 105°C for certain period as specified under standard test and checking the brightness fall thereafter.

Bristol Board: A well sized paper having even formation and good cleanliness generally above 150 mm g/m² of board consisting of one or more plies not combined by pasting, made wholly from bleached pulp and suitable for printing.

Bristols: A general term for a solid or laminated heavy weight printing paper or board made to a thickness of 0.15 or higher. The name is derived from the original pastel rag content board made in Bristol, England.

Brittleness: That property of a material which causes it to break or fail when deformed by bending. It is of practical interest only when the deformation

producing failure is small. For example, a sheet of paper or board which has undergone severe degradation as a result of ageing exhibits brittleness. It cracks and breaks when bent only slightly.

Broadleaf: An adjective used to describe hardwood, or deciduous, trees which have relatively broad, flat leaves such as Acacia, Sel, Teak, Salai, Eucalyptus, etc.

Brocade: A type of paper subjected to heavy embossing.

Broke: Paper that has been discarded anywhere in the process of manufacture. 'Wet broke' is paper taken off the wet end of a paper machine and 'Dry broke' refers to the spoiled paper discarded from dryers or calenders, the trimming from cutting and reeling section, or in paper discarded finishing section, for manufacturing defects. It is usually returned to a repulping unit for reprocessing.

Broke Beater: A beater equipped with steam jets adjacent to the back fall area and used for repulping wet strength broke from paper machines.

Broke Box: A large wooden container on wheels which the broke boy uses to haul broke from the source to the broke pit.

Broke Bundle: A collection of quantity of broke which is sometimes tied up into large size bales to facilitate transportation.

Broke Handling: A combination of pneumatic and mechanical conveying equipment which carries paper broke and brimmings, etc, discarded during the manufacture of paper to the broke pulper.

Broke Pit: A pit in the floor of a paper mill building, usually located over broke pulpers or broke conveyors to pulpers, into which broke from the process is dumped.

Broke Pulper: An equipment which disintegrates broke (q.v.) into pulp slurry to be reused in the process.

Broken Edges: Edges of paper or paper board in sheets or rolls which have been broken or ruptured through faulty operations or rough handling before, during, or after shipment.

Bromide Photographic Paper: A photographic paper base coated with an emulsion in which the photosensitive material is primarily silver bromide. It is the most popular type of printing paper for enlarging because its high sensitivity to light allows short exposure times.

Bronze: A metallic, copper-base alloy with tin and sometimes other metals used extensively in the paper industry to make paper machine wire, rolls refining tackles, etc.

Bronze Crepe Paper: A type of crepe paper that has a bronze surface finish achieved by coating it with

copper, gold, or silver metallic-based substance. Also called Bronze paper.

Bronze Paper: A paper or board coated on one or both sides with a composition consisting of a finely divided metallic powder and a binder of pyroxylin, casein, glue, etc.

Bronze Specks: Particles of metal picked up during processing or from the press roll. Bronze specks may also occur as a dendritic growth which is characteristic and is known as a bronze fleck.

Bronze Colour: In the appearance evaluation of paper, it refers to the metallic-like colour observed by viewing the surface in the general direction of specular reflection, producing a hue which is usually quite different from that observed in other directions.

Brown: In the appearance evaluation of paper, it refers to the colours like dark yellow or dark orange, etc.

Brown Groundwood: Type of groundwood pulp in which logs are steamed in digesters prior to grinding. The steam is used to soften the wood but also discolours it so that the resulting pulp becomes dark brown. Also called brown pulp.

Brown Mechanical Pulp Board: Board made principally from brown mechanical wood pulp (see 'Brown Mechanical Wood Pulp').

Brown Mechanical Wood Pulp: A wood pulp obtained by grinding steamed logs.

Brown Mixed Pulp Board: Board manufactured from waste papers sometimes with the addition of other pulps, and coloured brown on both sides.

Brown Stock: Unbleached pulp from the cooking process in a pulp mill.

Brownstock Washer: An equipment that continuously removes washable spent cooking liquor and other soluble matter present in the cooked pulp. There are various designs with the most common being the rotary drum vacuum filter washer.

Brown Stock Washer Losses: The residual dissolved solid left in the brown washer pulp leaving brown stock washers. They are determined and reported as total Na as Na_2SO_4 or Na_2O in Kg per M.T. of washed pulp.

Brown Stock Washing: A pulp mill process consisting of the removal of washable spent cooking liquor and other soluble matter present in the cooked pulp.

Brown Wrapping Paper: A paper usually made from unbleached kraft pulp. It is sold in various roll widths and diameters and in sheets. Since it is used for wrapping purposes of all kinds, strength is the most important property.

Brown Print Paper: A lightweight, translucent paper designed for brown print coatings (for example ferric-ammonium oxalate or citrate and silver nitrate).

This paper is normally made of cotton pulp and is used for the negative from which positive blueprints are made. It is characterised by high wet-tensile strength, good wet-rub resistance, hard internal and surface sizing and in most cases considerable durability and permanence.

Bruishing: Defect in calandered papers and boards in which excessive pressure or heat of calenders has caused discolouration appearing as grey or black mottling.

Brush Coater: Paper coating equipment used for brush coating (q.v.).

Brush Coating: The process of applying a semifluid mixture of the pigment and binder to a sheet by means of a revolving cylindrical brush and smoothing the coating so applied by means of oscillating flat brushes which contact the coated sheet as it is being drawn forward while held tightly on a moving rubber apron or a revolving drum.

Brush Enamel Paper: A specially coated, smooth paper with a highly brilliant surface, obtained by polishing the sheet with brushes before it is calandered.

Brush Marks: Those marks left on the surface of coated paper by the brushes used in spreading the coating material. They may be due to defects in the brushes, in the coating material, or in the adjustment or operation of the brushing machinery.

Brush Polishing: Applying a high glass to the surface of specially coated paper by the rubbing action of a revolving cylindrical brush turning at a higher peripheral speed than the paper.

Brush Polishing Machine: A machine used for brush polishing (q.v.).

Brush-finish Coating: A paper coating which is given an especially high polish by running the dried or partially dried coated paper over a revolving drum provided with rapidly revolving cylinder brushes which contact the coated surface of the sheet.

Brushing: (a) The mechanical action on the fibres during refining that causes the loosening of thread like elements from the fibre outer wall also called fibrillation. (b) The act of applying a wire brush to a revolving pulpstone surface to clean the stone. It is used sometimes in lieu of a burr to extend the burning cycle.

Brushing Kraft: A M.F. fourdrinier unbleached kraft sheet used as windbreak protection for young plants, such as melons. It derives its name from the brush to hold it in place.

Brushing Out: The process of producing thread-like elements extending from the inner and outer wall of fibres during the refining operation of pulp. This aids formation of a sheet on the paper machine by

providing increased fibre-to-fibre bonding. Also called fibrillation.

BTU: Abbreviation of British Thermal Unit: A unit of energy used in the measurement of heat. It is equivalent to 1/180 of the quantity of heat required to raise the temperature of 1 pound of liquid water from 32°F to 212°F at standard atmospheric pressure. (A slightly less accurate definition is the quantity of heat required to raise the temperature of 1 pound of liquid water by 1°F.)

Bubble Coating: A white, opaque coating containing little or no pigment consisting of a film of casein, starch, other binders, or mixtures thereof, in which minute air pockets are dispersed.

Bubbles: Blisters occurring between two plies of a board made on a cylinder machine due to a lack of ply adhesion. Also called air bubbles, bells, and blows.

Bucket Conveyor: A means of transporting dry material from one place to another. It consists of buckets attached to single or multiple chains, ropes, or belts.

Bucket Elevator: Elevating conveyor consisting of buckets attached to single or multiple chains, ropes or belts. It is used to transport dry material like lime, salt cake, etc.

Buff Copying Paper: A copying paper coloured buff, a moderate shade of yellow.

Buffer Storage: The pulp storage chests between the pulp mill and the paper mill provided to store sufficient pulp stock to avoid any disruption in the operation of pulp mill and in paper production. It also helps in equalizing the pulp quality.

Buffers: (a) Various devices or materials used to reduce shock due of physical contact. (b) Chemicals which are capable of neutralizing both acids and bases in solution and thereby maintaining the original hydrogen ion concentration (pH).

Buffing Paper: An abrasive paper (q.v.) which is coated with flint grains and is used in buffing operation in the leather industry where a smooth, velvety finish is desired. Buffing paper is usually made on a cylinder machine.

Building Board: A general term for large boards used in the building trade and manufactured from organic or inorganic raw materials or both. The term is broader than wallboard and includes structural, acoustical and core materials as well as coverings for walls and partitions.

Building Paper: A general term applied to a class of papers used in general construction work. They are used in building construction for sheathing and under flooring and may be converted to such products as roofing, sheathing, and tarred or asphalt-coated vapour barrier. They are also used in the manufacture

of rock wool, mineral wool, and fibreglass insulation batts.

Built-in Stress or Strain: A physical property of paper attributed to the type of stress or strain developed as a result of tension caused by shrinkage during the drying process.

Bulge: A slack piece in the felt caused by that part of the felt being held during a jam in the dryer, or by allowing a thick, bulky wad of wet broke to run around the circumference of a dryer or dryer felt roll.

Bulging: The process of producing a slack place in a felt.

Bulk (a): A paper or board is said to bulk high when its apparent density is low. (b) The number obtained by dividing the thickness of paper or board expressed in micron (0.001 m) by its grammage expressed in g/m². It is expressed in m³/g. Sometimes termed as Bulk Index.

Bulk Density: Bone dry mass per unit volume of raw material chips used in a pulp mill cooking process. It is expressed as kg per cubic meter. Also referred to as packing factor.

Bulk Factor: A value of sheet bulk obtained by dividing bulk thickness by air-dried grammage and is the same as the apparent specific volume, that is the inverse or reciprocal of specific density.

Bulk Handling: The transporting, treating, and processing of materials in large masses and volumes.

Bulk Index: The value of bulk obtained by dividing the caliper of the sheet by the air-dried grammage. *See* 'Bulk Factor'.

Bulk Number: The caliper of eight sheets of paper divided by eight, the result divided by the grammage and this result multiplied by ten is called bulk number.

Bulk of Pulp: The apparent specific volume, calculated by dividing the single-sheet thickness in thousandths of a millimeter or microns by the basis weight in grams per square meter. *See* Bulk. Bulk is reciprocal of density.

Bulk Storage: Storing of materials in large masses and volumes.

Bulkhead: An upright partition in storage chests bins, and tanks, separating them in a number of compartments. It also refers to entrances to these storage areas.

Bulking Dummy: A dummy (q.v.) of blank sheets of paper made up to determine the actual bulk of a given number of sheets which are to be used in the manufacture of a book or other printed matter.

Bulking Number: The number of sheets of a paper required to bulk one inch (2.54 cm) in overall thickness under no extra load over it.

Bulky: Of a sheet, lacking in compactness; having a light weight for a given thickness.

Bulking Book Paper: A paper having unusually high bulk. It is made from variety of furnishes, selected and blended to give this property. Some grades are made of cotton linter, rag in mixture with chemical pulps, some grades contain a large percentage of mechanical wood pulp mixed with chemical pulps. There is little or no loading (fillers). This paper is usually made to specification as to finish or caliper, or both.

Bull Screen: Coarse screen with large perforations on to which pulp from a grinder flows by gravity at one to three percent consistency to remove knots, slabs, large slivers, and other large objects before further screening. These may be vibrating flat screens or large, horizontal rotating perforated cylinders.

Bull Screen Rakers: Devices used on pulpwood grinders to facilitate the discharge of rejects from the bull screen.

Bull's Eye: A roll of paper made from one continuous sheet with no splices.

Bunch Plater Finish: A kind of paper finish produced when a pile of paper usually from 2.5 to 4.0 cm in thickness, is placed between zinc plates or press boards (without any fabric) and passed through the plater press. The process gives a uniform surface on both sides of the paper, slightly smoother than the original finish.

Bunched Plated: A paper provided with a special finish by the process of bunched plating (q.v.).

Bunched Plating: A method of plating a pile of paper between plating boards which consists in running it through a plater in such a way that both sides have the same finish.

Bungs: See 'Cork Plugs'.

Burlap: A coarse, woven fabric, usually made of jute.

Burlap Finish: (a) A finish resembling the texture of burlap cloth. It is produced by using sheets of burlap between the sheets of paper in a plater book. The same effect may be produced by attaching burlap to calender rolls and running the paper through these rolls or by using rolls etched to simulate burlap on an bossing machine. (b) A finish of hanging paper produced by bossing.

Burlap Lined Paper: A wrapping paper, usually made of kraft, pasted to a loosely woven burlap cloth. It is used where an exceptionally strong, waterproof, and tear-resisting wrapper is required. It is usually asphalted.

Burn Out: The phenomenon of a sheet of paper losing colour or brightness during the drying process.

Burning of Chips: The result of improper cooking of pulp in digesters due to cooking chemicals imbalance, increasing temperature too fast, and overheating. It

causes the chips to char before proper separation of the fibres, producing darkened pulp and incompletely cooked chips with burnt centres.

Burnished Finish: Another term for glazed finish. A high-gloss paper and paperboard surface finish produced by polishing coated paper on calenders, burnishers, and glazing machines. It is some times restricted to flint and friction glazing.

Burnisher: A machine quipped with rubbing stones used to polish a hard, damage to a stone face, specifically an area on a pulpstone face in which embedded charred wood or other burned or charred material occurs, usually due to lack of shower water. It may also be caused by the presence of a material difficult to grind, such as stone, glass, etc, which raise the temperature in the area beyond the charring point.

Burnt: (a) Of papers, overdried and brittle. (b) Of pulps, over-heated and darkened in the cooking process.

Burnt Pulp: Darkened pulp resulting from burning of chips. Also referred to as stock cook. The process of burning is also called Dressing. See Dressing.

Burr: A special tool used to sharpen pulpwood grindstones. Also called a bush roll as stone dresser.

Burr Holder: A pulpwood grinder device made up of bearings and a spindle on which a sharpening tool is mounted.

Burr Impression: The design pattern or mark made by a pulpwood grindstone sharpening tool on the surface of the stone. Also known as Burr Pattern.

Burr Lead: The slope angle of the teeth on the surface of a spiral type pulpwood grindstone sharpening tool. Sometimes referred to as the burr tooth angle.

Burr Number: A method of grading burrs on a pulpwood grinding based on the number of points they have per square centimeter of surface.

Burr Tooth Angle: The angle formed by the axis and the tooth of a pulpwood grindstone sharpening tool. Similar to burr lead.

Burring: (a) Resurfacing pulpstone with a surfacing tool called a burr. Also known as dressing or jigging. (b) A metallic paper machine wire problem which occurs when wear causes metal to feather out, resulting in decrease drainage. Normal causes are heavy loading on the wire, excessive vacuum on the suction boxes, or misaligned forming boards or deflectors.

Burst: A rupture in the web that does not extend to the edge.

Burst Factor: The quotient of the bursting strength (expressed in g/cm^2) and the grammage of the paper or board (expressed in g/cm^2) determined by standard method of test.

Burst Index: The bursting strength of a paper of board, expressed in kilopascal (kPa) divided by the grammage (substance) of the conditioned paper or board expressed in g/m^2 .

Bursting Strength: The hydrostatic pressure applied at right angles to the surface at which rupture of a circular area of the paper occurs under prescribed conditions of test. This is expressed in kgf/cm^2 .

Bus: A main electrical conductor which carries a heavy current for a number of machines.

Butchers Manila: A paper similar in nature to dry-finish butchers, except that it has a steam or water finish and is usually made in manila colour.

Butt Splicer: A machine that automatically splices paper and paper-board by applying single-sided adhesive tape to hold the pieces together end-to-end.

Butt Splices: Splices made on certain converting equipment (especially in heavy basis weight paper, board, etc). The trimmed ends of the web do not overlap but are held together end-to-end with single sided adhesive tape, or in some similar fashion. A strip or paper may also be pasted on one or both sides to form a continuous web.

Butted Splice: A butted joint which is formed by trimming the ends of two webs of paper, placing them end to end and pasting a strip over and under to make a continuous web without over-lapping.

Butter Paper: A semitransparent or opaque paper used for wrapping butter. Vegetable parchment or uncalendered grease-resistant paper (plain or waxed) is usually used. Important properties are greaseproofness and high wet strength.

Butterfly Valve: A type of shutoff or regulating valve, distinguished by having a cylindrical body with a disk or vane on a shaft installed perpendicular to the axis of the cylinder. It is used in pulp and paper mills on low-pressure, large-size process lines, and can be hand, remote or automatically operated.

Button Board: A paper board made from reclaimed waste paper stock and used to make the inside base for inexpensive buttons.

Button Cardboard: A bristol-type lightweight board, used for displaying and merchandising buttons.

Button Specks: Specks in rat-content papers caused by small pieces of buttons that appear in the finished sheet as light-coloured powdered spots.

By-pass: The routing or deflecting of liquid or any other flowing material from the main process stream, around a part, such as a valve, meter, pump, etc, and back into the main stream.

By-product: Something produced during the pulp and paper making process in addition to the principal products, such as saw dust, chipper dust, waste pulp fines, etc.

Banding: Covering the ends and sides of a box or lid with paper glued all over.

Bending Boxes: Mechanical indentation of the material to give the line of fold in making boxes.

Board, Leather Pulp: Board generally manufactured on an intermittent board machine and containing not less than 50 percent of leather.

Benzoate Paper: Paper treated with benzoate, generally sodium benzoate, to inhibit corrosion when in contact with certain metals.

Box: A rigid container having closed faces used mainly as an exterior container for transportation. It can also be a set up box, three dimensional and rigid in construction having a base and a lid and delivered in a finished form.

Brightness Test: Laboratory procedures used to determine the degree of whiteness of pulp, paper and paper boards and reported in values as specified by the type of equipment and method used.

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Cable Marking Paper: Usually a lightweight twisting paper cut into narrow strips for incorporation in wire cables or ropes as a mark of identification. It is usually coloured and is frequently printed to aid in identification.

Cable Paper (Turn Insulation): A paper suitable for use as insulation on wire or cable. It is usually made from manila rope hemp or sulphate pulp. Because of the narrow widths about 0.8 mm at the minimum, it must have sufficient strength to withstand the high speed bending and winding operations both during manufacture and use of the cable or wire. The thickness range from 0.015 mm to 0.22 mm. The paper should be free from foreign materials having high dielectric strength and low power factor. These are especially important at higher voltage. Good stability under dry heat and subsequent treatment with insulating inquids, high machine direction tensile strength and cross-machine direction tearing strength are necessary.

Cadmium Yellow: Paper making pigments varying from pure to slightly greenish yellow, and are modifications of cadmium sulphide (CdS).

Cake: The dewatered pulp mat as it comes off a filter of press.

Calcium Carbonate: A chemical compound (CaCO_3) occurring in nature usually from sea depositions, marble, limestone or obtained commercially by chemical precipitation. Calcite and aragonite are the two principal crystalline types with calcite being the thermo dynamically stable form. Chalk is naturally occurring from used only to a limited extent in papermaking because of impurities

present. The precipitated carbonate is preferred due to its obvious higher purity and smaller particle size than the natural product. This carbonate may be produced by precipitation of milk of lime with carbon dioxide gas or sodium carbonate, or precipitation from calcium chloride-sodium carbonate reactors. Calcium carbonate is used both as a filler and as a coating pigment. It is used as a filler in cigarette paper.

Calcium Sulphate: A chemical compound of general formula $\text{CaSO}_4 \cdot \text{H}_2\text{O}$. The compound is very slightly soluble in water and is used primarily as a filler pigment. When the material exists in nature, it may be in form of anhydrite (CaSO_4) or as gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). Precipitated calcium sulphate is known as crown filler ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$).

Calcium Sulphite: A chemical (CaSO_3) prepared by interaction of sulphurous acid and calcium hydroxide and used as a filler or coating pigment.

Calender: A set of 'Stack' of horizontal cast-iron rolls with chilled hardened surfaces, resting one on the other in a vertical bank at the end of the paper machine. The paper is passed between all or part of these rolls to increase the smoothness and gloss of its surface.

Calender Back Board: A type of stiff, lined paper board made from chemical pulp mixed with recycled fibre and used as a mounting baseboard for various kinds of printed calendars.

Calender Bowl Paper: See 'Calender Roll Paper'.

Calender Crush Finish: A crushed paper which has been calendered with a water finish. It is used for such papers as express mill wrappers and for such boards as imitation pressboard.

Calender Crushed: A paper having defects of sheet crushing due to excessive pressure in calendering, and usually with decrease in opacity, surface mottling, and duller colour.

Calender Cuts: Slits, or glazed or discoloured lines across the sheet resulting from the passage of wrinkles through the calender nips.

Calender Dyed: Dyed or stained at the calender rolls. The dye solution is supplied from the calender boxes to the calender rolls, which transfer it to either one or both sides of the paper or the board.

Calender Finished: A term applied to any paper with a surface glazed by means of calenders; it does not include plate finish but refers to machine finish, English finish, supercalendered, and calender-friction glazed.

Calender Friction Glazing: A special type of calender consisting of a compressible non-metallic roll and a smaller metal roll. These rolls are so geared that the smaller has the higher peripheral speed.

Calender Marked Paper: Paper having marks caused by defects on the calender rolls or foreign material adhering to the rolls.

Calender Pad Bond Paper: A paper having the characteristics of maplitho or ordinary bond paper and having bulk specifications required by calender manufacturers.

Calender Roll Blocking: The adherence of paper to the calender due to improper temperature, pressure, humidity or coating conditions.

Calender Roll Paper: A soft, unsized, non-acid cotton and paper used in the manufacture of rolls for supercalenders and embossing machines. The paper is cut into disks or octagons and pressed on a shaft under very high pressures. The rolls are finally turned down and polished on a lathe. Sometimes termed as Bowl paper.

Calender Scabs: A mark on a sheet of paper or board caused by a particle of pigment or of fibre that adheres to a roll in the calender stack and emboses its shape into the surface of the sheet.

Calender Scales: Small particles of pigment or other foreign materials that gather on the calender roll and are pressed onto the paper.

Calender Sizing: The application of an emulsified wax size or solution of a starch, alginate, polyvinyl alcohol, or other filmforming adhesive to paper or paperboard at the calender, usually for the purpose of improving surface properties, such as sizing, smoothness, porosity, and printability. The paper or board may be treated on one or both sides.

Calender Spots: Glazed or indented spots, often translucent, resulting from small flaked or pieces of paper adhering to the calender rolls or carried through the nips on the sheet.

Calender-Stack Crumbs: Small flakes of paper which collect at the calender of the paper machine and which are probably formed by the crushing action of the calender upon localized thick areas of the paper sheet.

Calender Streaks: Continuous streaks of darkened paper occurring parallel to the grain, caused by uneven pressing and drying preliminary to calendering.

Calendered Paper: Paper that has been subjected to calendering (See 'Calendering').

Calendering: The operation of imparting finish or glaze to a sheet of paper by passing it through a calender or supercalender.

Calf Board: A heavy paper embossed to resemble leather and used in the manufacture of books.

Calf Paper: Coloured embossed paper which imitated leather. It is usually used for bookbinding.

Calibration: (a) Ascertaining, usually by comparison with a standard, the locations at which scale/chart graduations should be placed to correspond to a series

of values of the quantity which the instrument is to measure, receive, or transmit. (b) To adjust the output of a device to bring it to a desired value, within a specified tolerance, for a particular value or the input, or to ascertain the error in the output of a device by checking it against a standard.

Calico Paper: Type of paper with a surface resembling calico, used primarily for decorating purposes.

Caliper: The thickness of a sheet of paper or paperboard, measured under certain specifically stated conditions expressed in units of thousandth of an inch, called 'Mils', or in 'microns' when measured in micrometers.

Calorie: A unit of thermal energy defined as the amount of energy required to raise 1 gram of water from 14.5 to 15.5°C and also referred to as the 15°C gram calorie. A kilogram calorie is the amount of energy required to raise a kilogram of water through the same temperature rise.

Calorific Value: Number of heat units liberated when a unit mass of the fuel is burnt under certain specified condition.

Colorimeter (Colourimeter): A optical test instrument or device for determining and specifying colours some times by comparison with a standard colour set.

Cambium: A thin formative layer of cells between the bark and wood of trees and other woody plants. It gives rise to new cells and is responsible for the growth in width.

Cambric Finish: A finish with a design resembling cambric cloth, which is produced by plating or embossing.

Cambric Finished Paper: Paper whose surface has been plated or embossed to resemble fine linen or cotton cloth.

Candle Paper: A well sized, coloured, lightweight paper made from chemical and mechanical pulps with little or no strength characteristics. It is used extensively in the manufacture of pyrotechnic materials.

Candle Wrapping: A cheap grade wrapping paper of deep blue shade used for packing candles.

Candy Twisting Tissue: A tissue paper which is also called kiss paper, used for wrapping candy kisses, salt-water taffy, candy bars, photographic film, gum, etc. It is made from unbleached or bleached chemical pulp and is usually waxed. Generally it is made on fourdriniers. It has a high tensile strength in the machine direction and high tearing strength in the

cross direction. The sheet is soft and raggy, takes a good finish when waxed, and retains its twist.

Candy Wrapping Paper: High-gloss glazed, or waxed papers used to make printed wrappers for candy products. Glassine and lacquer coated papers are also used.

Candy-bag Paper: Paper usually made from bleached chemical pulp. It may have an M.F. or M.G. finish and may be embossed or decorated with varying designs. It is sold in various width rolls of jumbo diameter to manufacturers of candy bags. Characteristics are strength, cleanliness, and appearance.

Candy-cup Paper: Glassing paper used for forming fluted cups for packaging individual pieces of candy.

Candy Wrappers: Glassine, glazed, waxed, or plain sheets which are usually printed and which are used as sanitary protection for candy products. Printed wrappers are frequently coated with a lacquer or varnish for high gloss. Also referred to as Candy bar Wrappers.

Cant Hook: A leverage-type tool equipped with a hook-like element and used to move and handle pulpwood logs.

Canvas: A common paper mill reference to a type of cotton base paper machine dryer fabric used to maintain intimate contact between the sheet and drying cylinder. It helps control sheet shrinkage, and minimize cockling and edge curl in the sheet. Also called canvas duck or canvas asbestos duck.

Canvas Note Paper: A note paper embossed to resemble canvas.

Capacitance: The ratio of the electrical charge on a condenser to the potential difference between the terminals of the condenser.

Capacitor Paper or Capacitor and Tissue Paper: A chemically pure, uniform very thin paper with good dielectric properties made from sulphate pulp or hemp fibre. It is used to make electrolytic absorbent separators between foils in the manufacture of condensers and capacitors. Also called condenser paper or condenser tissue.

Capacity: (a) The maximum output or production capability of a piece of process machinery, unit process, or entire mill in the pulp and paper industry. It is usually stated in units of kg or tonnes per day. (b) The quantity of material a process unit can handle. For instance a pump capacity is the number of m³ per minute of water it will pump under a specified set of conditions.

Capillary Rise: The height to which a liquid will rise in a test piece of paper or board under the standard condition of test.

Captive Generation: Generation of power in an industrial unit for in-house consumption. *See* 'Co-Generation'.

Captive Pulp: Pulp used by a paper mill that is made in a pulp mill on the same site and integral to it. May also refer to pulp (Market pulp, in particular) made by one mill and by another belonging to the same company.

Carbohydrates: Any of a group of neutral compounds composed of carbon hydrogen and oxygen, such as sugars, starches and celluloses.

Carbon Black: A term covering very fine carbon powder in micro particle size produced by the thermal decomposition of hydrocarbons like fuel oil methane etc. Each of the five principal processes develops its own characteristic carbon; Channel or Impingement Carbon Black, Furnace Carbon Black, Lamp Black, Thermal Carbon Black, and Acetylene Carbon Black.

Carbon Monoxide (CO): A constituent of power and recovery boiler flue gases, the amount of which is related to combustion efficiency in the boiler. It is a very toxic gas.

Carbon Paper: (a) A coated paper used for making multiple copies with pencil, pen, typewriter, or business machine, commonly known as carbon or duplicate copies. It may be coated on one side [Semicoated or both sides (full-coated)] with a mixture of carbon black or some other colouring material in a vehicle, which may be wax or some oil-soluble substance according to the intended use. The application is generally made by means of a coating machine with heated rolls revolving in melted inks, or a rotary or rotogravure printing press only printing on certain sections of the paper. It may be supplied in different finishes such as intensive writing, medium writing, or hard writing. Varieties include pencil, billing machine, adding machine, typewriter, hectograph and lithographic transfer. (b) In photography, a paper coated with gelatine and a pigment.

Carbon Spot: Spots caused by fragments of cinder or coal dust. Cinder specks is a synonym.

Carbon-Black Bag Paper: A speciality paper made from M.F. fourdrinier unbleached kraft, in various grammage and in many types, black or dark gray in colour. It is used for packaging and shipping carbon black.

Carbonates: A term often applied to fillers, like calcium carbonate or precipitated chalk.

Carbonate Paper: A printing paper formerly used largely for magazine publishing. Replaced to a large extent by the advent of machine coated papers. It is currently of lesser importance and is generally sold to the commercial printing trade. It is made of chemical pulps heavily loaded with calcium carbonate,

generally unsized, with a supercalendered finish and of good colour and opacity.

Carbonized Forms: Paper used in sets, being sheets or continuous forms or unit books, the backs of which are so coated with a pressure transferable pigmented layer that copies of all or part of the original manuscript or typescript can be obtained without inserting separate sheets of carbon paper.

Carbonizing Base Paper: A grade of base paper made from bleached or unbleached chemical pulps or mixtures of unbleached chemical and mechanical pulps. It is the raw stock to be surface coated on one or two sides with a carbon dope (solvent or wax). Significant properties include uniformity of surface and caliper, freedom from pinholes, close formation, high density strength, nonporosity and ability to take carbon inks without penetration and to release them subsequently under pressure or impact.

Carbonless Paper: (a) A reproduction paper coated on one side with a waxy carbon-like impact-sensitive, mechanical transfer coating and used primarily in producing typed or handwritten multiple copies. (b) A chemical transfer reproduction paper when the donor and receptor material are coated together on one side of the sheet and impact ruptures the donor capsules to produce an image.

Cardboard: A general term applied to a board of thickness 0.15 mm or more where stiffness is the paramount characteristic. The word cardboard as used by the public is too vague to be technical. In the paper industry the term board is generally used in combination with words indicating its character or use.

Cards: A term usually applied to the sizes cut from various kinds of boards (usually bristols). Their use is indicated by prefixing another word, such as business, postal, visiting, wedding, etc. The word card as used by the public is too vague to be technical.

Carpet Brown: *See* 'Carpet Felt'.

Carpet Felt: A kind of soft, thick and spongy building paper, plain or indented, used for inserting between floor boards and carpets. It may be made on a cylinder or fourdrinier machine from paper stock, roofing, rags, etc. It is also called carpet brown, carpet lining, or deadening felt.

Carpet Lining: *See* 'Carpet Felt'.

Carrying Roll: The rolls on paper machine that support the wet-end wire, wet-end and dry-end felts, and are not driven.

Carryover: (a) Water droplets and soluble salts entrained in it, that come over with the steam from boilers due to poor separation in the drum because of improper drum level. (b) The cooking liquor that comes over with the relief gases during the sulphate cook in a batch-type digester. Also known as pullover.

Carton: (a) A general term loosely used to indicate (i) a folding paper box, (ii) a rigid setup box, or (iii) a fibreboard shipping container. (b) A general term usually applied to a folding paper-board box as distinguished from a set up or rigid box or a shipping container.

Carton Compact: Pasted board, of a minimum grammage of $1\,000\text{ g/m}^2$ and having at least one strong kraft or similar linear, suitable for the manufacture of packing cases.

Carton Stock: Any paperboard normally made and used for the manufacture of folding paper boxes (q.v.).

Carton Liner Paper: A paper placed inside a carton to give added protection to the contents. It may be greaseproof, glassine, or waxed paper. The liner may be sealed for additional protection.

Carton Sealing Paper: Any paper used as a wrapper for carton containing cereals, crackers, salt, or other foodstuffs and designed to protect the packaged material from contamination. A heat-sealing waxed paper or a lacquered paper may be used. The grammage will depend upon the size of the carton and the desire of the user. It is usually printed or decorated with a design.

Cartridge Paper: A hard sized and strong paper generally free from loading and usually with a rough surface, substantially free from fluffing characteristics.

Cascade Evaporator: A type of evaporator used to concentrate sulphate black liquor before burning in a recovery furnace. It consists of a series of rotating vertical disks or tubular elements partially immersed in pre-evaporated liquor and partially subject to contact with the hot combustion gases from the furnace.

Casein: The acid-coagulable protein of skim milk obtained as a by-product of the dairy industry. It is used in the sizing of paper and as an adhesive in the manufacture of coated papers.

Casing: (a) The metallic outer container enclosing the pulpstone of a pulpwood grinder. (b) The outer shell of a pump which encloses the impeller. Also called the housing. (c) A hard-tough unbleached wrapping paper usually high rolled size.

Cassie: A few outer sheets of a ream of good paper.

Cast Coated Paper or Board: Coated paper or board in which the coated surface is dried in contact with a highly polished metal surface, either in the form of a cylinder or a continuous belt.

Castor Oil Test: A measure of the receptivity to oil-based inks of easily permeable printing papers; it determines the time required for a drop of castor oil to be absorbed and produce a translucent spot when viewed under a light at a particular angle.

Catalogue Paper: A lightweight coated or uncoated printing paper designed for use in the printing of

various types of catalogues, directories, etc. It is usually made from chemical, mechanical or reclaimed pulps and is characterised by good printability and opacity.

Catalyst: A substance or agent that is added to a process to either initiate or accelerate the rate of chemical reaction without entering into or chemically affecting the reactants or end product.

Cathode: The negative pole in an electrolytic cell.

Cathode Ray Tube (CRT): A vacuum tube in which cathode rays, usually in the form of a slender beam, are projected on a fluorescent screen. It is used to produce video displays on remote viewers and computer system operator interfaces in the mill.

Cation Exchange Process: A process of purifying water from mineral salts by treating with cation exchange process. The reversible exchange of positive ions between functional groups of the ion exchange medium and the solution in which the solid is immersed. It is used for treating boiler feed water and also in waste water treatment for removal of cations, that is calcium, magnesium, etc.

Cationic Starch: A type of starch that has been given a positive charge in order to increase its adhesion to the fibres and retention in the paper in which it is used. It is use either as wet-end additive or in size press to improve retention and other sheet properties.

Catwalk: Bridging passageways between or along process equipment or areas of a mill.

Caustic: A term used to refer to corrosive alkaline chemicals and substances used in pulp and paper manufacturing. Also indicates Caustic Soda.

Caustic Extraction: A stage in the pulp bleaching sequence (E) that normally follows the chlorination stages to remove alkali-soluble chlorinated lignins.

Caustic Extracted K. No: A measure of the bleachability of pulp tested immediately after the caustic extraction stage in a pulp bleaching process.

Caustic Soda: Sodium Hydroxide (NaOH) chemical used as a raw material and found extensively in pulp and paper processing materials, especially in the soda and sulphate process.

Causticity: The NaOH content divided by the active alkali content (all expressed as Na_2O) or kraft cooking liquor and expressed as percent:

$$\frac{\text{NaOH}}{\text{NaOH} + \text{Na}_2\text{S}} \times 100$$

Causticizing: Converting green liquor to white liquor by the use of slaked lime $[\text{Ca}(\text{OH})_2]$ which reacts with the sodium carbonate (Na_2CO_3) in the green liquor to form active sodium hydroxide (NaOH) in the white liquor. Also called recausticizing.

Causticizing Efficiency: A percentage found by dividing the amount of NaOH by the amount of NaOH

and Na_2CO_3 in the white liquor from the causticizing process (both chemicals being expressed as Na_2O). A correction is made for NaOH content of the original green liquor in order to represent only the NaOH produced in the actual causticizing reaction.

Cavitation: The alternate formation and collapse of vapour bubbles inside control valves and pump casings.

Cell Wall: A more or less rigid membrane enclosing the protoplast of a cell. In higher plants composed of polysaccharides, chiefly cellulose, and other organic and inorganic substances. Term has triple usage (a) cell wall of an individual cell. (b) partition between two cells composed of inter-cellular substance and two walls belonging to the two adjacent cells. (c) primary or secondary wall layer. In paper making fibres, the cell wall is that portion, which is defined by the relation $\frac{D-d}{2}$ where D is fibre diameter and ' d ' is lumen diameter.

Cellophane: A thin, transparent, moistureproof sheet made from chemically regenerated cellulose used extensively as a packaging wrapper.

Celluloid: A trade-mark for a thin, high strength, flammable, transparent plastic material made from cellulose nitrate and camphor.

Cellulose: The main solid constituent of woody plants, occurring widely elsewhere in the vegetable kingdom. Chemically it is a linear polysaccharide of high molecular weight. Cellulose is the white fibrous material remaining after a large portion of the lignin and certain carbohydrates have been removed from the woody material by pulping and bleaching.

Cellulose Films: Nonfibrous cellulosic sheets, usually transparent, manufactured from cotton or wood or bamboo pulp by regeneration from solutions passed through a slit into a coagulating bath. The viscose process is the most common; cellulose is treated with sodium hydroxide and carbon disulphide to form a solution of sodium cellulose xanthate and is regenerated in an acid bath. Cellulose films may be plasticized, coated, or dyed and are used extensively in wrapping. Films may also be made by evaporation of solvent from solutions of cellulose esters and others. These films are not cellulose, but the unchanged derivatives, for example cellulose acetate or ethyl cellulose.

Cellulose Lacquer: Solution made up of various cellulose compounds in a suitable organic solvent with other materials so that it can be applied as a coating, such as on paper, that will leave a protective, highgloss, film-like finish when the solvent evaporates.

Cellulose Napkins: Multi-ply napkins made from facial tissue stock.

Cellulose Wadding: (a) A material consisting of fibres of chemical pulp loosely matted into a sheet

formed on a Yankee cylinder or fourdrinier machine and creped off a Yankee drier. It is used in bleached grades as an absorbent material in hospitals and for sanitary purposes; in unbleached and treated grades for packaging thermal, acoustical, and other application. It is available in single or multiple-ply sheet form either plain or embossed, and is frequently backed with various papers which provide certain required characteristics not available in the cellulose wadding grades alone. (b) Dry-formed wadding. A material made from shredded pulps or paper or from various textile fibres or combinations of these. The web may be air formed or produced with carding or garnetting equipment such as found in the textile industry. It is used for cushioning, packaging, accoustical, and thermal insulation, for sanitary purposes and other applications. It may be treated with an adhesive or binder either homogeneously or on the surface.

Cement Sack Paper: A strong, flexible kraft paper, either flat or extensible, used in the manufacture of multiwall sacks, for packaging cement, lime and similar products. This paper is normally manufactured against specifications which define minimum physical properties that permit the finished multiwall sack to perform its heavy-duty packaging function. Special sheets may be used as an inner lining, which serves as a water-or moisture-proofing medium. The lining may consist of waxed, asphalt-laminated, or plastic coated paper, or plastic film.

Centres: Tubes of wood, metal or strawboard used for the winding up reels of paper.

Centrifugal Pump: A type of pump commonly used to move liquids and stock slurries through a pipeline. Its principle of operation depends on the centrifugal force to develop a pressure rise on the flowing medium proportional to the speed and diameter of its internal spinning impeller.

Centrifugal Screen: A type of screening equipment which separates the finer fibres from coarse particles, fibre bundles in the pulps stock by centrifugal action of vanes.

Centrifugal Separators: Types of stock cleaners used in a paper mill to remove heavy dirt particles by separating and removing them from the fibre using centrifugal force, the most common being the rotating and pressure drop types.

Chadless Paper Tape: A type of perforator tape (q.v.) wherein the punching is incomplete, that is, the tiny paper circles (chads), still adhere to the body of the tape. This type of punching is generally used in applications where information pre-printed on the tape need to be read after punching.

Chads: Tiny circular pieces of paper which result from punching operations, as for example in 'punched' tape.

Chain Lines: (a) The more widely spaced watermark lines which run with the grain in laid paper, caused by the 'chain wires' (also called twists or tying wires), which are twisted around the laid wires to tie them together. They are usually about 2.54 cm apart. (b) Markings resembling impressions of rope or a chain which are formed in paper as the result of unequal stresses. They appear in the calendered sheet and are generally due to irregular formation, that is heavy and light streaks in the machine direction.

Chalk-overlay Paper: A lightweight paper with a heavy coating of chalk. It is not exactly a printing paper, although it is used to assist in the printing of halftones. The total thickness of paper and coating are usually between 0.02 to 0.35 mm. Some is coated only on one side and some on two sides, according to the preference of the printer. The coating is special in its formulation and requires special supervision during manufacture. The finished paper is uniform in thickness and smoothness and sufficiently strong to withstand the etching operation.

Chalking: (a) A printing defect, in which ink pigment may be easily rubbed from the surface of paper. (b) A condition encountered in some papers where fine particles of pigment leave the sheet during the finishing, converting printing operation, or subsequent use.

Chalky Appearance: Not glossy, either as a result of the nature of the coating materials or of the coating process.

Channelling: An undesirable movement of part of the material mass in a reactor tower or storage tank at a greater speed than the remainder of the mass moving through the vessel. Channelling disrupts homogeneity and uniform distribution as well as retention time and reaction time in such operations as towers in bleach plants, pulp storage chutes, chip bins, continuous digester, etc.

Charcoal Drawing Paper: A drawing paper especially suited for use with charcoal sticks or pencils. It is usually a cotton fibre content sheet. A surface suitable for 'taking' Charcoal and good erasability are necessary characteristics.

Charge: (a) To fill a batch-type digester with chips and cooking liquor; (b) The chips and cooking liquor in the digester.

Charging Floor: The floor level in a digester house of a pulp mill where chips are fed into the digester and usually where the digester is operated from.

Chart Paper: (a) A paper having good surface and dimensional stability characteristics. (b) A strong, tough, dimensionally stable, hard-sized (usually tub-sized) paper, used for recording instruments. (c) A paper sometimes called recording instrument paper

and use for that purpose in circular flat form or as rolls for strip chart instruments.

Check Book Cover: A dense rigid board lined with a plain white surface on one side and either a plain or usually embossed coloured paper on the other. Usually referred to as an embossed 14-ply news filled board, 50 points thick.

Check Valve: A valve that automatically stops backflow when the fluid flow in a pipeline reverses.

Cheese Wrappers: Vegetable parchment, glassine, grease-proof, foil-laminated and waxed papers used for wrapping cheese, the type of paper depending upon the nature of the product.

Chelating Agent: A Chemical complex which causes an ion, usually a metal, to be joined in the same molecule by the both ordinary and coordinate valence forces. Such linkages result in the formation of one or more heterocyclic rings in which the metal atom is part of the ring. Commercially available chelating agents like EDTA, may be used to remove traces of metal ions in industrial and biological processes.

Chemi-thermomechanical Pulp (CTMP): Pulp made by the thermomechanical process in which the wood or any other raw material chips are pretreated with a chemical, usually sodium sulphite, either prior to or during presteaming, as an aid to subsequent mechanical processing in refiners. Sometimes referred to as thermo-chemical mechanical pulp (TCMP).

Chemical Charge: (a) The amount of chemicals put into a batch-type digester with the chips to make one cook. (b) In a single-stage batch bleaching process, the quantity of chemicals added and usually consumed in bleaching one batch of pulp.

Chemical Coagulation: The destabilization and initial aggregation of colloidal and finely divided suspended matter by the addition of a floc-forming chemical.

Chemical Fibre Paper: Paper made entirely from chemically prepared pulp, usually bleached.

Chemical Filter Paper: A type of good strength, unsized, porous paper used in chemical filter presses and similar equipment to remove suspended materials from process liquids. It is usually made from chemical pulp and/or cotton fibre.

Chemical Fog: Chemical entrainment in recovery boiler flue blue gasses that are not removed by mechanical devices such as scrubbers and exist in an extremely fine state of division.

Chemical Loss: The percentage of total chemical not recovered in the recovery process of a sulphate pulp mill. It is determined by dividing the quantity of make up chemical consisting of sodium hydroxide and/or sodium sulphate, added in recovery system by the total alkali in the cooking liquor fed to the digesters, all expressed as Na_2O .

Chemical Losses in Evaporators and Furnaces: Percentage of total chemical loss in the evaporation and burning process of a sulphate recovery cycle. It is determined by dividing the total alkali to the evaporator plus sodium salts in the new chemical minus the total alkali in the green liquor by the total alkali to the digester.

Chemical Losses in Pulp Washing: The percentage of total chemical loss in the pulp washing process after cooking. It is determined by dividing the total chemical fed to the digester, minus the total chemical supplied to Recovery Plant in the form of Black Liquor by the total chemical fed to digester, all expressed as Na_2O .

Chemical Loss in Reausticizing and Mud Washing: Percentage of total chemical loss in the sulphate liquor reausticizing and mud washing process of a pulp mill recovery cycle. It is determined by dividing the total alkali in the green liquor, minus the total alkali in the white liquor, by the total alkali in the cooking liquor to the digester.

Chemical Manila Writing: A writing paper made from chemical pulp and having a 'Manila' colour.

Chemical Oxygen Demand (COD): A measure of the oxygen consuming capacity of inorganic and organic matter present in water or wastewater. It is expressed as the amount of oxygen consumed from a chemical oxidant in a specific test. It does not differentiate between stable and unstable organic matter and thus does not necessarily correlate with biochemical oxygen demand. Also known as OC and DOC, oxygen consumed and dichromate oxygen consumed, respectively.

Chemical Precipitation: (a) Precipitation induced by addition of chemicals. (b) The process of softening water by the addition of lime or lime and soda ash as the precipitants.

Chemical Pulp: Pulp obtained from wood or other materials of vegetable origin by a chemical treatment eliminating the greater part of the nonfibrous components. The fibres so obtained can generally be easily separated without the necessity for further mechanical treatment.

Chemical Recovery: The recovery of chemicals in sulphate cooking liquor after it is used to cook raw material in the digester (spent liquor). It is expressed as a percentage determined by dividing the total alkali to the digesters minus the sodium sulphate added to liquor by the total alkali in the cooking liquor going to the digester after correcting for any change in liquor inventory.

Chemical-to-Wood Ratio: Ratio of the weight of chemicals charged to the weight of oven dry/wood or any other material charged to a digester.

Chemigroundwood: A pulping process which includes the exposure of barked logs to sodium sulphite and sodium carbonate solutions at elevated temperature and pressure prior to grinding.

Chemimechanical Pulp (CMP): Pulp made by pretreatment of chips with chemicals at moderate temperature followed by atmospheric refining.

Cheque Paper: A high grade writing paper having good degree of opacity and strength in which devices to prevent fraud are introduced by special water marking or litho-printing with sensitive inks or sensitising with chemicals to render erasure or alteration easy for detection (See 'Safety Paper') Strength, writing qualities and in some cases, sensitivity to chemical and mechanical erasure are significant properties.

Chestnut Board: A board formerly made from chestnut pulp but more recently from pulp or other hardwood species. To date, the term is applied to a range of brown boards made essentially from semichemical pulp. 0.229 mm fourdrinier grades for corrugating medium are sometimes referred to as chestnut medium. Cylinder grades of solid fibre with dense formation, high stiffness and rigidity are made in thicknesses of 18 points or 0.457 mm and up (with lamination of 250 points or 6.35 mm) for various industrial uses.

Chevoit: (a) A term used to describe the appearance of paper made with a small percentage of deeply coloured fibres added to the basic lighter coloured furnish to give a granite effect sometimes called mottled paper. (b) A term sometimes used to designate lightweight coloured antique paper used for the facing of boards.

China Board: A cylinder, machine-coated, multi-ply paper board made primarily of recycled newsprint stock in a variety of colours to be converted into tags, tickets, and similar items.

China Clay: A term applied to the beneficiated kaolin. It is mined in several countries. Its grade and quality depends on its whiteness, particle size and fluidity in slip form.

China Paper: A soft waterleaf (unsized) paper made in China from bamboo fibre. It has a pale yellow colour and a very fine texture. The usual size is 142.2 cm × 63.5 cm. It is used by (engraved) plate printers to pull proofs. It is also called Chinese Paper or India Paper.

Chip: (a) A paperboard, made from paper stock-usually mixed papers. (b) A small piece of raw material like wood, bamboo produced by a chipper in a form suitable for cooking in pulp digesters.

Chip Bin: Storage chamber for chips located directly over batch-type digesters from which they are filled. Also called Chip silo.

Chip Charge: The quantity of air dried chips that are fed into a batch-type digester to make up one cook.

Chip Crusher: A hammer or pin mill where oversize fractions of chips are returned from the chip screens to be reduced in size.

Chip Decay: A gradual decomposition of wood/bamboo chips caused by a fungus that thrives at the expense of the fibre portion. Chip decay can be reduced by spraying the wood with water. Wood saturated with water will not decay. Wood below 20 percent moisture and above 60 percent moisture is not subject to decay due to fungus.

Chip Digger: A unit that is driven into a chip-filled freight car and sucks the chips up into a suction unloading system.

Chip Feeder: A positive displacement-type device designed to feed chips at essentially atmospheric pressure into a pressurized processing unit, such as a presteaming vessel or digester, without loss of pressure. These units are usually rotary-type valves or enclosed screw-type conveying devices.

Chip Filling: A process of loading a batch-type digester from a chip bin above the digester or from a conveyor transporting wood chips from a silo to the floor above the digester top.

Chip Meter: A volumetric chip feeding device whose action can be monitored and correlated to the quantity of chips passing through it.

Chip Packing: A method of removing air from chips as they are being charged into a digester, usually by the use of a steaming device in order to achieve greater penetration of cooking liquor into the chips.

Chip Pile: Chips that are stored outside in a mound type of structure usually located near the pulp mill so that chips can be conveniently conveyed from it to the digester storage.

Chip Screens: Rotating, gyratory, vibrating, or inclined stationary screening devices which are used to separate oversized chips, slives and saw dust from the accepted chips sent to the digester for cooking. Oversized chips are returned to crushers for reprocessing and dust is disposed off either as fuel in heat recovery boiler or as land fill.

Chip Silos: Large concrete or tile chip storage areas usually sized to hold enough chips for pulp mill operation.

Chip Storage: The storage of chips in bins or silos constructed of wood or concrete, or concrete lined, usually located above the digester so that the chips can be fed into the digester by gravity. Cylindrical steel bins are also in use.

Chipboard: Board made on a continuous machine from waste paper mainly of a low grade.

Chipper: A machine consisting essentially of a revolving disk called Disc chipper equipped with heavy knives, set approximately in a radial direction, which cuts pulp wood, bamboo and saw mill wastes into slices or chips, diagonal to the grain. There are other types of chippers like, drum chipper and spiral chipper.

Chips: Pieces resulting from the cutting of wood, bamboo, weeds in chippers in the wood preparation area of a pulp mill prior to conversion into pulp in the digester(s).

Chloride Photographic Paper: A photographic paper base coated with an emulsion in which the photosensitive material is silver chloride. Since the sensitivity of these papers are quite low, they are used only for contact printing. Hence, they are sometimes referred to as contact papers.

Chlorination: In pulping the treatment of wet pulp in bleaching operation with a compound containing available chlorine, as a step in removing unwanted non-cellulosic matter and bleaching the pulp.

Chlorination Stage: The step in a multi-stage bleaching process ('C' stage) where chlorine water or gas is mixed, allowed to react, and then washed as an initial operation in a complete pulp bleaching system.

Chlorinator: A device for adding a chlorine-containing gas or liquid to mill wastewater. Sometimes the term is also used to refer to the chlorine mixer in the bleach plant.

Chlorine: A poisonous greenish-yellow gas (Cl_2) which is commonly used for pulp bleaching and water purification either in liquid form or as a component of bleaching powder or bleach liquor made out of dissolving chlorine gas in lime slurry or caustic soda solution under controlled conditions.

Chlorine Consumption: Actual amount of chlorine consumed to bleach pulp, expressed as pounds/kgs of chlorine use per air dry ton/tonne of pulp bleached, or a percentage of the same basis. It may also be expressed on a bone dry basis.

Chlorine Demand: The difference between the amount of chlorine added to water or waste water and the amount of residual chlorine remaining at the end of a specified contact period. The demand of any given water varies with the amount of chlorine applied, time of contact, and temperature. In case of unbleached pulp, the chlorine demand indicates the quantity of chlorine required to bleach the pulp up to a certain brightness level.

Chlorine Dioxide: A chemical (ClO_2) used in pulp bleaching usually in one or more of the latter stages of a multistage bleaching sequences. It is prepared at the plant site from sodium chlorate or sodium chloride by a variety of process. It is explosive when present in air at a concentration above 4 percent by volume.

Chlorine Dioxide Stage: The step or steps in a multi-stage bleaching process ('D' Stages) where chlorine dioxide solution is mixed with pulp, allowed to react, and then washes as one of the operation making up a complete pulp bleaching system.

Chlorine Evaporator or Gassifier: A specially constructed, thermostatically controlled vessel using hot water or steam to vaporize liquid chlorine transferred from tank cars or cylinders to a pulp mill bleach plant. This vaporized product is used in the chlorination stage of a bleaching process, as well as to make up hypochlorite bleaching liquor. Also called chlorine vaporizer or chlorine gassifier.

Chlorine Mixer: A mixing device used in the bleach plant to mix chlorine gas with unbleached pulp slurry.

Chlorine Number: The number of grams of chlorine consumed by 100 gms of moisture-free pulp in 15 minutes at 25° C. It indicates the lignin content of the pulp, provides a measure of the extent of delignification during cooking, and indicates the bleach requirement of the unbleached pulp.

Chlorine Process: A soda-chlorine process for pulping straw which incorporates four steps: (a) alkaline pre-treatment. (b) gas chlorination. (c) alkaline wash. (d) hypochlorite bleaching.

Chloro-Bromide Paper: A photographic paper base coated with an emulsion in which the photosensitive material is primarily silver chloride with a small proportion of silver bromide. It is faster than chloride paper by a factor of ten and though most often used for contact printing is sometimes used for enlarging.

Chroma: The intensity of the colour of paper and paper products related to its depth or weakness.

Chromatic Aberration: An image imperfection caused by the light of different wavelengths focusing in different planes.

Chromatic Paper: A mottled paper having several colours on the surface or different coloured fibres in the same sheet. It is used chiefly for box papers.

Chromaticity: That part of a colour specification which is given by dominant wavelength and purity or alternatively the trichromatic coefficients.

Chromatographic Paper: An absorbent paper with very high alpha-cellulose content, free from substances other than cellulose, specially made for chromatographic purposes.

Chromatography: Chemical analysis of mixtures of solutions through selective absorption of the substances in solution by suitable absorbing materials.

Chromo Paper or Board: A paper or board coated on one side with material containing adhesive, kaolin, etc, to give a surface suitable for high grade multi-coloured printing.

Chuck: A device which produces a means of holding a paper roll in winding, rewinding, or unwinding operations. It usually consists of a metal expandable core inserted in the ends of a roll or roll core to ensure concentric running on the spindle.

Cigarette Paper: (a) A strong variety of tissue paper of finest quality unsized and free from pinhole, and having special fillers, generally intended for cigarette manufacture. (b) A strong tissue paper of close, uniform texture, free from pinholes, used as a wrapper for tobacco in the manufacture of cigarettes. It is generally made from hemp, flax or jute pulp, and contains no size. This paper may be either combustible or noncombustible. Combustible paper (q.v.) also called free burning paper, contains from about 15% to about 30% of calcium carbonate filler. All cigarette paper is made from highly beaten stock which contributes to its high strength and uniform formation but which, at the same time, necessitates the addition of large percentages of filler to provide the desired porosity.

Circuit Breaker: An electrical protective device that automatically opens a circuit under overload or short-circuit conditions. It can also be used for making breaking, or changing connections in an electrical circuit under other abnormal conditions.

Circular Cutter: A cylinder having knives set on its surface at an acute angle and used for cutting sheets of paper from a roll.

Circulation: (a) In steam-generation boilers, it refers to the continuous movement of water down the downcomers up the generating tubes, and through the drum. (b) In batch digester, it refers to the movement of cooking liquor during the pulping process, which can be natural or forced.

Clad Digester: A digester to which the inner surface is covered with a layer of stainless steel sheet to prevent corrosion from cooking chemicals. Also called Cladding.

Clamp Marks: Marks in paper produced by the clamps which hold it in position for guillotine trimming.

Clarification: (a) The removal of turbidity and suspended solids but settling in mill raw water or wastewater treatment. (b) In the causticizing plant in a pulp mill, it refers to the settling out of suspended materials from green and white liquors.

Clarifiers: Tanks of special designs in which suspended solids are allowed to settle and be removed as sludge. In recovery plants for green and white liquors in the causticizing areas or effluent and water treatment plants, clarifiers are invariably used.

Classifier: (a) A device for separating pulp fibre in liquid suspension according to fibre length and particle size by depositing the fractions on known mesh wire cloth for final drying to determine bone dry weight.

(b) A device on a coal pulverizer outlet that separates oversize particles and recycles them back to the pulverizer. (c) In soda recovery plant, an equipment used to remove grit and unreacted lime or lime stone pieces from the lime slurry preparation process.

Clay: A natural, earthy, fine-grained material, primarily aluminium silicate, which is pasty when wet and becomes hard when baked or fired. In paper making, clays as used for paper coating pigments and fillers. Example: Kaolin, China clay, Paper clay, Bentonite, Attapulgate clay.

Clay Lump: A lump of pigment or dried coating colour embedded in the surface of a coated sheet and sufficiently large to cause difficulties in subsequent use of the paper.

Clay-coated Blanks: A paperboard with a clay coating on either one or both sides. The clay coating may have been applied onto the board at the time of manufacture or a white or coloured clay-coated paper may be pasted onto an uncoated board surface. It is made in standard thicknesses and used for all types of printing, such as calenders, cutouts, advertising cards, etc. Significant properties are excellence of printing surface, colour permanence and a high degree of whiteness and brightness.

Clay-coated Boxboard: A grade of paperboard that has been clay coated on one or both sides to obtain whiteness and smoothness. It is characterized by brightness, resistance to fading, and excellence of printing surface. Coloured coatings may also be used and the body stock for coating may be any variety of paperboard.

Clay-filled Paper: Paper containing an appreciable amount of clay as a filler, especially as distinguished from paper filled with other inorganic white pigment.

Clean Flow: When a batch digester is discharged in full into a blow tank with no uncooked chips or pulp remaining in the bottom of the digester or in the blow line from the digester to the blow tank.

Clean ID Fan: An induced draft fan in a recovery furnace located ahead of the precipitator.

Cleaning: An operation intended to eliminate unwanted extraneous matter in pulp, paper and board by physical means.

Cleaning Tissue: A good-strength, soft absorbent sanitary lightweight paper made from bleached chemical and mechanical pulp. It is used to make up toweling and wiping materials for both domestic and industrial purposes.

Clearance: (a) With reference to piston operators, it is the short distance at each of a cylinder after the strokes cycle of the piston is completed (one half of the total length of the cylinder minus the stroke of the piston). (b) The distance between the surfaces of the plates in a refiner through which pulp is passed for

mechanical treatment. (c) The distance between any moving and stationary parts of machinery.

Clipper Seam: A method of joining the ends of paper machine canvas type dryer fabric to form an endless belt.

Close Formation: The formation of a sheet that is uniform and free from a wild (q.v.) or porous appearance when viewed by transmitted light.

Closed Cycle Bleaching: A pulp bleaching process in which all polluting waste water discharges are recovered.

Closed Cycle Mill: A paper mill concept in which all effluents are recovered thereby eliminating water pollution by the mill. Also called effluent-free mill or 'ZERO' pollution mill.

Closed Loop: A family of automatic control units linked together with the process in such a way as to form a chain so that the effects of the control actions are constantly measured. If the process deviates beyond the desired limits, the control units react to bring it back into line.

Closed Transfer: A means of transferring the wet sheet web from the wire section to the wet press of a paper machine and includes the suction and yankee pickup. Also referred to as closed draw.

Cloth Centered Paper or Board: Reinforced paper or board made up of two sheets or furnish layers with muslin or cloth between them.

Cloth Lined Paper or Board: A general term descriptive of any paper or board upon which cloth is pasted. The board/paper should have a surface to which the cloth will adhere and it should be rigid and nonwarping.

Clothing: A term applied to paper-machine felts and fourdrinier wires.

Cloud Effect (Cloudy): Unevenness in look-through. Also called wild formation.

Cloud Finish: A cloudlike effect produced by dropping water suspended white pulp onto coloured paper in the process of formation on the fourdrinier wire.

Clover Leaf Press: A type of paper machine wet-end press that has three rolls, with two suction rolls located 45° below the horizontal centerline of the center roll.

Clupacking: See 'Extensible Paper'.

Clutch: A coupling device used to connect or disconnect a driving end, a driven part of a machine such as parts or sections of a paper machine.

CMC: A commonly used abbreviation for carboxymethyl cellulose, an additive used as sizing chemical in special papers for the improvement of sizing quality. There are different qualities of CMC

depending on its viscosity used in surface size or beater size formulation.

Coagulation: In water and wastewater treatment, the destabilization and initial aggregation of colloidal and finely divided suspended matter by the addition of a floc-forming chemical or by biological processes.

Coal Fired: A term referring to various types of power boilers that use coal as a fuel.

Coarse Papers: Papers used for industrial purposes as distinguished from those used for cultural or sanitary purposes.

Coaster Board: Heavy paperboard, made of wood pulp or reclaimed paper stock, that is reasonable absorbent with a minimum of warping (or distortion) when wet or after drying following moisture absorption. It has a reasonably good finish for printing. Since excessive grain or fibre direction in an absorbent die-cut piece of board usually contributes to warping, the most successful coaster stock has been made on wet machine with the board air or steam dried. Coaster board made on cylinder machine are pasted to obtain the required thickness.

Coated Art Paper: A paper used for high grade printing work, especially in halftone printing, where definition and detail in the handling of shading and highlights are important. It is usually a high-grade coated paper having a high brightness and a glossy, highly uniform printing surface. Also called 'Art Paper'.

Coated Board: A general term indicating a paper-board which is clay coated. This board is used for box making and miscellaneous purposes.

Coated Bond Paper: A bond paper coated on one side or on both sides and used when the strength of a bond paper and a smooth printing surface are required. Sometimes high grade art papers are made in this manner.

Coated Box-covering Paper: A paper similar to box-cover paper except that it has been coated on one side with a clay coating. A high gloss lacquer may be applied over the clay coating to enhance the appearance. Strength not always essential but must have good folding and bending qualities.

Coated Chromolitho Paper: A paper used for high grade multi-colour lithographic work. It is usually a glossy, high-quality paper, coated on one side for the lithographic process.

Coated Chromotype Paper: A paper similar to coated chromolitho, used for printing from type, but not necessarily sized for the lithographic process.

Coated Cover Paper: Coated paper used as cover paper but with a coated surface. It is usually coated on both sides and has either a dull or high finish.

Coated Glassine: (a) Glassine coated with a film applied from an organic solvents; it is transparent, water resistant, and water-vapour resistant — the last property depends on the type of lacquer used. Another property which is often important in solvent coated papers in heat sealing. (b) Glassine coated with a hot-melt coating which is applied from a molten bath without solvents.

Coated Index Bristol: A regular chemical pulp index bristol which is coated on two sides with a special coating suitable for use on gelatine-type duplicating machines; its surface is also suitable for letterpress and offset printing.

Coated Lithograph Paper: A paper used in lithographic printing, especially where there are a large number of colours used in the picture or design reproduction. It is sized for the lithographic process and is frequently coated on one side.

Coated Magazine Paper: A coated printing paper used for magazines, periodicals and the like. The term is applied to a broad range of 'on-machine' and 'off-machine' coated stocks produced from mechanical and/or chemical pulps. This grade is also referred to as Periodical Publishing Paper.

Coated Mottle: A defective coated paper having slight variation of gloss in the sheet which can be detected by viewing the surface in specular reflection. The pattern somewhat resembles that found on a piece of galvanised metal.

Coated Offset Paper: A grade of coated paper with a high resistance to picking, coated on one or two sides and sized the same as coated lithograph paper, suitable for use in offset printing.

Coated Paper: Any paper which has been coated. This term covers a wide range of qualities and grammage.

Coated Postcard Stock: A heavy weight card stock coated on one or both sides and used in the manufacture of 'Picture Post Cards'. It is usually made from chemical and/or reclaimed pulps in thickness of 0.203 mm to 0.279 mm and is well sized for pen and ink writing.

Coating: (a) A term applied to the layer of pigment and adhesive substances which has been applied to the surface of paper or paperboard to create a new surface. (b) A term applied to the film of substance usually clear, used as a barrier or other functional covering on the surface of paper or paperboard. (c) Surface sizing Film-coating. (d) The operation or applying a coating, formulation of any of the above types to the surface of a sheet. Air knife coating, Blade coating, Brush-finish coating, Cast coating, Flow-on coating, Knife coating, Machine coating, Polished drum coating, Print-on coating, Roll coating, Spray coating, Wire wound rod coater are various types of coating operation.

Coating Base: A term referring to any type of paper or paper board before it is coated. Also called coating raw stock.

Coating Clay: Any clay suitable for coating paper, generally characterized by fine particle size fluidity of slip and high brightness.

Coating Colour or Coating Slip: The coating mixture in suspension or slurry form which is applied to the surface of the paper or paper board in the coating process. It includes the pigment, adhesives, dyestuffs, modifiers, and the liquid medium (usually water) required to carry and apply the components to the paper.

Coating Grade Clay: A high quality clay, usually kaolin, that meets specifications for use in paper coating. Freedom from grit, correct particle size, good colour and brightness, low viscosity, and purity of mineral type are necessary requirements.

Coating Kitchen: An area or room in a paper mill located in the stock, preparation area where paper coating and colouring materials are stored, prepared and mixed in proper proportions. Some times referred to as colour kitchen, colour room, or mixing room.

Coating Raw Stock: Any paper used as a base paper for coating. The type of paper varies with its ultimate use.

Cobb Test: A method for measuring the water absorptiveness of sized paper and paperboard, by determining the mass of water absorbed through one surface under a definite temperature and pressure and time.

Cock: A form of valve having a tapered plug with a hole that is rotated to provide a passage for fluid.

Cockle: Local deformation of a sheet of paper due to unequal shrinkage giving it a slightly crumpled appearance.

Cockle Finished Paper: A paper with ripple-like finish caused by shrinkage during drying under little or no tension. It may be caused deliberately or inadvertently and is frequently desired, in varying degrees, in some grades of writing papers.

Coefficient of Friction: The ratio of the frictional force to the force, usually gravitational, acting perpendicular to the two surfaces in contact. The coefficient is a measure of the relative difficulty with which the surface of one material will slide over an adjoining surface of itself or of another material. The static or starting coefficient of friction (μ_s) is related to the force measured to begin movement of the surfaces relative to each other. The kinetic or sliding coefficient (μ_k) is related to the force measured in sustaining this movement.

Coffee-Bag Paper: A strong printable paper used in the manufacture of coffee bags. It is usually made from bleached or unbleached chemical pulps. It may be

calendered, coated, ribbed or fluted and/or embossed. The usual grammage are from 49 gsm to 82 gsm (Grams per Square meter).

Coffee Filter Paper: A lightweight, high wet-strength, porous paper used in certain types of coffee percolators and automatic coffee makers to remove grounds from the coffee extract.

Cogeneration: Generation of power in an industrial power plant to produce both steam and electricity for in-plant use, as well as for sale to outside utility companies. Sometimes this term is also used for Captive generation.

Coils: Paper slit to a desired width from a roll of paper and rewound on cores for use in small width machines using a continuous roll of paper. Coils generally refer to small rolls used in adding machine cash register rolls, teleprinter, fax, etc.

Cold Blow: The introduction of cold weak black liquor to a digester to reduce the temperature of the pulp stock to be blown to the blow tank. This reduces fibre degradation during blowing operation. Also refers an experimental method of emptying a batch type digester with a compressed air of steam pressure from an accumulator tank after the free liquor is drained from it into the accumulator tank.

Cold Caustic: Sodium Hydroxide (NaOH) solution used to cook raw material at ambient temperature one of the pulping process called 'Cold Soda Pulping'.

Cold Caustic Extraction: A stage or the pulp bleaching process in the preparation of high alpha-cellulose dissolving pulps in which the high consistency pulp is steeped in over 10 percent caustic soda to dissolve out the hemicellulose, other short chain length celluloses and resin.

Cold Caustic Pulp: Pulp produced by treatment of wood or any other raw material like bagasses, bamboo, straw, etc, with caustic soda solution at mill temperatures and atmospheric pressure prior to mechanical defibrizing. Also called Cold Soda Pulp.

NOTE — The term may also be applied to dissolving grade pulps which have had a cold caustic extraction stage in the bleach sequence. These pulps have a high purity or alpha cellulose content as the result of the extraction.

Cold Grinding: A method of preparing mechanical pulp in which the temperature of the pulp in the grinder pits is controlled by the use of large volumes of cold water.

Cold Pressed: Soft-dried paper which has been pressed in a hydraulic press.

Cold Pressed Finish: An extreme antique finish, usually applied to a heavyweight ledger paper. Such paper is used for diplomas, drawing purposes, maps, etc.

Cold Soda Pulp: See 'Cold Caustic Pulp'.

Cold Steep Bleaching: A method of bleaching a high consistency pulp sheet formed in a feltless wet machine or a vacuum thickener equipped with press rolls so that it is self-supporting. The bleach liquor is applied to both surfaces of the sheet by spraying it onto the rolls for even spreading.

Cold Working Pressure: The maximum pressure rating of a pipeline, valve, fitting, etc., that is coincident with the ambient temperature of otherwise understood to be in the range of -29°C to $+38^{\circ}\text{C}$ (-20°F to $+100^{\circ}\text{F}$).

Colophony: Another term for rosin, a residue from the distillation of gum from resinous pine trees. It is used for internal sizing of paper and paper board.

Colloid Mill: A machine for dispersing or mixing a solid or liquid in a liquid. Its essential feature is the relative motion, usually at high speed, of two very closely spaced, surfaces, which produces intense shearing stresses in the liquid and the solid particles flowing between these surface. The shearing stresses are due to viscous forces in the liquid, rather than to a grinding action between the moving surface.

Collotype Printing: A type of planographic printing in which a gelatin coated glass or metal plate is used as the printing surface. Glass plates may be used on flat-bed presses and grained zinc or aluminium plates on rotary or offset presses. The process is based on the fact that when a soluble bichromate salt is added to a gelatine coating, the ability of water to swell the gelatin decreases with increasing exposure to light. The coating is exposed through a negative and is then soaked in water. The uneven swelling in the surface of the exposed gelatine coating causes it to form into a pattern of very fine wrinkles. Glycerin and salts are added to the last rinse to keep the coating damp. When a greasy ink is applied to the damp coating the wrinkled surface accepts ink in proportion to the amount of light exposure it has received. In lightly exposed areas, the ink adheres to the coating as small, widely spaced, specks or grains of ink with increasing exposure, the grains become larger and more closely spaced until they fill in solid. Collotype is halftone process but the fine random grain pattern of the ink causes it to resemble continuous-tone photography. Paper used are offset, bonds, ledgers, vellums, cover, bristols, and practically papers are or boards that are tub sized. Coated and enamelled papers are also occasionally used. It may be used for postcards, art reproductions, displays, broadsides, posters, etc. This process is also known as Abbetype, Artotype, Heliotype, Lichtdruck, Phototype and Hydrotpe.

Colour: (a) That property of a substance which determines the nongeometrical part of the visual sensation experienced by an observer who views the substance. The colour of a specimen depends upon the spectral character of the illuminant, on the geometrical

and other conditions of illuminating and viewing the specimen, on the spectral reflectivity of the specimen, and on the characteristics of the observer's eyes. Hence the only characteristic of a specimen which is the same under all conditions of observation and for all observers is its spectral reflectivity. Knowledge of the spectral reflectivity of a specimen permits calculation of its C.I.E. colour specification—that is specification of dominant wavelength, purity, and luminous reflectivity. (b) The suspension or slurry of the materials for use in pigment coating of paper.

Colour Fastness: The property of a paper, dye or dyed paper to retain its colour in normal storage or use or to resist changes in colour when exposed to light, heat or other deleterious influences.

Colour Reversion: Loss of brightness during or after the bleaching process due to the development of unsatisfactory operating conditions or to ageing over a period of time. *See* 'Brightness Reversion'.

Colour Sheets: Paper carrying standard ink colours for each colour used in a multicolour printing job.

Colour Specification: The quantitative description of a colour. The colour specification of the international commission on illumination consists of a statement of dominant wavelength, purity and luminous reflectivity under standardized conditions. The colour of papers is often specified in terms of trichromatic coefficients x , y and z , and sometimes in terms of a matching certain standardized colour chips, or coloured papers previously designated as standards. Less exact approximations, such as requirements for reflectance at one or two wavelengths, are sometimes used in purchase descriptions.

Colour Spots: Various coloured spots are specks (blue, red, black, etc) in the sheet. They may be undispersed particles of colour pigment or undissolved dyes or they may also be caused by colour reactions with rosin, pitch particles, or other elements of the furnish which may give rise to a coloured froth or foam that accumulates back of the slices. When this dries and drops over onto the wire, many different kinds of specks are produced which mar the appearance of the finished sheet.

Colour Variation: In printing a term used to describe changes in colour of printing; or changes in the density of colour which may be caused by variations in the amount of ink accepted by paper or by the amount of ink fed to the paper. In papermaking, the coating formulation is called the coating colour. In this context, 'Colour variation' means variation in the coating formulation, as might be caused by uneven dispersion of application of the coating. It results in a deviation in paper shade of colour from standard.

Colour Brightness Tester: A photoelectric instrument designed to measure the reflectance of light

at various points distributed across the visible spectrum in terms of a reflectance standard.

Colourimeter: An optical test instrument or device for determining and specifying colours sometimes by comparison with a standard colour set.

Colourimetric Purity: The ratio of the luminosity of the spectrum colour to the luminosity of the mixture of illuminant and spectrum colour which matches the colour of the specimen viewed under the illuminant alone. Luminosity is the brightness sensation produced by unit intensity of light. Purity is also referred to as saturation or depth of colour, for example a deep red has a higher purity than a pastel red.

Column Strength: Load-carrying property of paper board, determined by the force that an unsupported section will withstand before bending, when the force is applied parallel to its plane.

Combination Board: A general term designating a board made on a cylinder machine wherein one or both of the outer plies are of a different raw material and/or colour than the middle ply, whereas a plain or solid board has the same material throughout. Where three stocks are used, or where two outside liners of the same stock are vat lined onto a filler of a different stock, this is customarily indicated in the name of the board. Buff patent coated news, white patent-coated news, bleached manila-lined chip, etc, indicate two different kinds of stock in each board and also indicate one liner. This is also indicated by the words 'Single lined' either together at the end of the board name or separated; bleached manila-lined chip, single-lined or single bleached manila-lined chip both mean chip centre and back, vat lined with one liner of bleached manila furnish. However, bleached manila-lined chip means exactly the same thing. When the top and bottom liners of a board are both of the same kind of stock, this is indicated by the words 'Double-lined' or 'Double'. Coloured liners are more or less definitely indicated in the name of the grade. Most boxboards and many paperboard grades are combination boards.

Combustible Paper: A cigarette paper which has been impregnated with a nitrate to control its burning properties.

Combustion Control: The automatic control of burning of fuel in power and chemical recovery furnaces so that it can be carried out to its highest efficiency.

Commercial Match: The duplication of a paper in a mill run which does not exactly match the sample but which is close enough to be considered acceptable.

Commercial Wove Envelope: A term originally applied to many uncoated papers made from chemical wood pulps for conversion into envelopes. It is now largely applied to a commodity-type envelope base stock as distinguished from bond, cotton content,

kraft, manila properties and other grades. It is generally made in white and colours and is often referred to simply as wove envelope.

Commercial Writings: Writing paper used in the conduct of business generally, such as tablet, bond, writing and ledger grades.

Communication Papers: Converted small roll paper products, of folded counterparts thereof, used for purposes of communication, Examples are teleprinter rolls, perforator tapes, teletype and telegraph tapes and papers used for inputs to, or print-outs from computers. The term is also used for various grades of writing paper particularly in cut-size (q.v.) form.

Compacting: A process for compacting the paper web in the plane of the paper and imparting a high degree of stretchability by passing the web between a roll and for example, an endless rubber blanket. The blanket is extended immediately before the point of contact with the web and allowed to return to its normal state during the passage of the web through the space between the roll and the rubber blanket.

NOTE — This should not be confused with creping.

Composite Fuel: A fuel for power furnaces made up of a blend of combustible solids, such as coal, waste material, etc, in a liquid carrier such as oil.

Composition (of Paper or Board): Nature and proportions of the component fibrous and non-fibrous constituents of the paper, as determined by suitable analysis.

Compressibility: The percentage decrease in caliper of the sheet produced by an arbitrarily specified increase in load. The condition under which the determinations are made must be completely specified. This definition must be distinguished from the definition of compressibility in engineering practice, which is the ratio of the fractional change in volume to the pressure producing that change in volume. This property is of considerable importance in several uses of paper, notably in printing and bookbinding.

Compressing: A refining action which results in densification of fibres.

Compression Resistance of Paper or Board: Compression resistance is the maximum load which a paper board can withstand before deformation under compression.

Compression Wood: An abnormal type of wood, occurring as a rule on the lower side of branches and of leaning tree trunks of all coniferous species. Typical compression wood can be identified in logs by the presence of markedly eccentric annual growth rings. There are usually large amounts of summer-wood in the wider portions of the rings as compared with the narrower portions. This summerwood appears less dense and less hornlike than normal wood.

Compression wood has a higher lignin content and a lower cellulose content than normal wood.

Compressor: A mechanical device for increasing the pressure of air or gas.

Computer: (a) A device capable of accepting information performing prescribed operation on this information and providing the results of these operations. Its major elements usually include memory control arithmetic logic and input and output facilities. (b) An automatic electronic machine for performing calculations used in pulp and paper making to monitor, control, and optimize manufacturing operations.

Computer Control: A process utilizing a special purpose analog computer to make appropriate adjustments to a continuous digester or other papermaking operation in order to accomplish a smooth transition from one operation condition to another.

Computer Printout Paper: A lightweight white paper made from chemical and/or mechanical or reclaimed pulps, which is used in computer printers. It is usually made and is put up in the form of small rolls of fanfolded sets-with or without interleaving carbon paper. It is also referred to as Computer readout or Computer output paper.

Computing Machine Paper: A general term for any paper used on computing machine, but it usually refers to bonds and ledgers.

Concora Test: It is the test to determine the crushing resistance of the corrugating paper and is measured by crushing 10 flutes prepared from a strip of 150-155 mm length and 12.7 ± 0.1 mm width (with the long edge parallel to the machine direction) through heated fluting rolls under standard conditions.

Concrete Curing Paper: A reinforced, waterproof paper designed to retard the drying of concrete (curing) by covering the surface immediately after the initial set. The paper is constructed of two kraft plies, usually wet strength, laminated with asphalt in which reinforcing material is imbedded, or polyethylene coated wet strength kraft laminated with reinforcing glass scrim.

Condensate: The liquid formed from the lowering of temperature of a saturated vapour, such as water formed from the saturated steam being cooled in paper machine dryers and condensing type turbines.

Condensate Removal System: A combination of process equipment, syphons, rotary joints, headers, condensate separators, condensers, and pumps designed and assembled to remove condensate from within paper machine dryer rolls, separate it from noncondensable vapours and condense any remaining steam so that it can be pumped to and used in the power and recovery boilers.

Condenser Paper: A paper used as a spacer between foils of electrolytic capacitors. This paper is made from sulphate pulp, cotton, or hemp. Thickness range from about 0.015 2 mm to 0.102 mm (0.000 6 to 0.004 inch). The important properties are porosity, absorption of electrolytic liquids, and chemical purity, especially freedom from soluble chlorides.

Conditioned Paper or Board: Paper or Board that has been prepared and treated so that the moisture is uniformly distributed throughout the sheet and has reached equilibrium with the surrounding air. *See* 'Conditioning'.

Conditioning of Paper or Board: Exposure of paper or board to accurately controlled and specified atmospheric conditions so that its moisture content reaches equilibrium with the surrounding atmosphere. *See* 'Conditioned Paper or Board'.

Conduction: (a) The passage of heat through or/along a mass or between two bodies in direct contact. (b) The passage of electric current in a device such as a wire.

Conductive Heat Transfer: The movement of heat from one portion of a mass to another portion of the same mass or between separate a contacting masses without particle displacement.

Conductor Insulation (Paper for): Paper intended for insulating purposes in electrical conductors.

Conduit: Various size metal or plastic pipes used to protect and carry electric wires around the mill or in a building.

Conifer: A cone-bearing tree or shrub so called because the fruit of the tree is a cone, as in the pines and firs. The wood is also termed as softwood.

Consistency Regulator: A control unit designed to detect the consistency of pulp stock in the flow line and activate a water dilution valve to bring the pulp stock to a desired consistency level.

Contact Angle: The angle at which the surface of a liquid meets the surface of a solid or of another liquid. The angle is measured within the liquid. For example, the contact angle of water on glass is small, whereas that of water on paraffin or of mercury on glass is large. This is a quantity of interest in the consideration of the penetration of liquids into paper.

Contact Bed: (a) An artificial bed or coarse material providing extensive surface area for biological growth in a watertight basin. Waste-water exposure to the surface may be accomplished by cycling or by continuous flow through controlled inlet and outlet. (b) An early type of wastewater filter consisting of a bed of coarse broken stone or similar inert material placed in a water-tight tank or basin which can be completely filled with waste-water and then emptied. Operation consists of filling, allowing the contents to remain for a short time, draining and then allowing the

bed to rest. The cycle is then repeated. A precursor to the trickling filter.

Contact Stabilization Process: A modification of the activated sludge process in which raw wastewater is aerated with a high concentration of activated sludge for a short period, usually less than 60 min to obtain BOD removal by absorption. The solids are subsequently removed by sedimentation and transferred to a stabilization tank where aeration is continued further to oxidize and condition them before their reintroduction to the raw waste-water flow.

Container: A term in the paperboard industry which refers generally to a paperboard box or receptacle. This is usually the outer protection used in packing goods for shipment, in contrast to a folding carton or rigid setup box for individual items or small bulk packaging.

Container Board: (a) Solid fibre or corrugated combined board used in the manufacture of shipping containers and related products. (b) The component materials used in the fabrication of corrugated board and solid fibre combined board; Linerboard (q.v.) Corrugated medium (q.v.); Chipboard (q.v.).

Contaminants: A general papermaking term application to extraneous and usually harmful matter in pulp or non-fibrous raw materials. The term is more specifically applied to such things as adhesives, wet-strength resins, inks, dirt, coatings, asphalt plastics, rubber, etc, found in recyclable waste papers.

Continuous: A process without interruption of handling or processing, as contrast to batch operation. Examples are continuous digesters, continuous coating, etc.

Continuous Digester: A cooking vessel in which chips are reduced to their fibre components in suitable chemicals under controlled temperature and pressure in a continuous operation.

Continuous Measurement: The monitoring of property of a reaction or process on a continuous basis to maintain quality control over the reaction or process.

Continuous Rating: An electrical term referring to a machine rated for continuous service and able to operate continuously at its rated output without exceeding any of the specified limitations, such as permissible temperature.

Contraries: Any visible matter that may be present and which is unwanted in the pulp (prior to stuff or stock preparation), stuff or paper under consideration.

Contrast Ratio: The ratio of the diffuse reflectance of a sheet when backed by a black body to that of the sheet when backed by a white body. There are several contrast ratios in use, the differences between them being the differences in reflectance of the white backing body.

Control Rolls: Very small rolls of writing paper which are used on bank proof machines in the processing of bank checks. Control rolls are used in connection with compartment rolls (q.v.).

Control Valve: Types of process control valves that are remotely operated, either from the output of an automatic controller or from a manual control station.

Controlled Variable: A process quantity or condition which is measured and controlled by an automatic controller.

Conversion: (a) Processes or operations applied to paper or board after normal paper making operations, such as waxing, gumming, off machine coating, printing, bag manufacture, envelope manufacture, box and container manufacture, etc. (b) The transformation of halfstuff into paper.

Converter: A plant which manufactures paper products, such as papeteries, envelopes, bags, containers, coated paper, gummed paper, etc. Such operations are generally carried out by primary paper and board manufactures as well as by independent companies not engaged in primary manufacturing.

Converting: The operation of treating, modifying, or otherwise manipulating the finished paper and paperboard so that it can be made into end-user products, such as special coating, waxing, printing and gumming and envelope bag and container manufacturing. Also called 'Conversion'.

Conveyor: A mechanical apparatus, usually consisting of an endless moving belt, a chain of receptacles, or a series of rollers, used to transport pulp and paper making materials in and around a mill.

Cook: (a) The process of reacting fibre-containing materials, such as wood, rag, straw, baggasse, etc, with suitable chemicals usually under high temperature and pressure, in order to reduce them into their component parts so that the acceptable fibres can be separated and made into pulp for further use in making paper. (b) A mill name for the digester operator (*See Cook*).

Cooking Cycle: The cooking operation in a batch-type digester from the time of the lid of the digester is closed for cooking operation to the time the digester is blown and lid is opened for next charge. Also known as lid to lid time.

Cooking Liquor: Chemical solution added to digesters to reduce chips into their fibre components by dissolving the non-cellulosic material like lignin, gums, resins, etc, resulting in pulp.

Cooking Time: The time lapse between the start of the steaming to the start of the blow of one cook in a batch type digester.

Cooling Roll: Hollow metallic, cylindrical roll located in the dryer section of a paper machine and operated at a lower temperature by the use of cooling

water in order to cool the hot paper sheet coming from dryer section. Also called seat roll. This helps in stabilising the sheet moisture and dimensional stability.

Copier: A machine by which reproductions are made directly from graphic material by xerographic or other methods.

Copier-plain/Copier Map PTG: A high quality whitewove paper having uniform finish, uniform caliper and grammage with good strength. It may or may not contain rag fibre.

Copper Number: The number of grams of copper reduced from the cupric to the cuprous state by 100 grams of pulp or paper under specified conditions. Copper number indicates the relative number of reducing groups in the pulp or paper and is used as a measure of its chemical quality and stability.

Copying Tissue: A group of tissue papers which are slack sized, soft in texture, and of considerable strength, for use in letterpress work or for special manifold purposes, such as railroad waybill copying.

Cord: Usually a pile of pulpweed 2.5 metre long, 1.25 meter wide and 1 m high, and containing 3.125 m³ volume.

Core: A tube, usually metal, wood, fibre board paper or paper board or metal-tipped fibreboard or paper on which paper or paper board is wound.

Core Board: A paper board for use in making cores upon which paper, textiles, etc., may be wound. It may be made from various grades of paper board, depending upon the end use requirements. It is cut into strips for spiral or convolute winding. The board has a surface adaptable for pasting and the resulting core should be crush-resistant. Resistance to splitting and uniformity of caliper are important characteristics.

Core Paper: A strong kraft paper or paper board made from unbleached kraft pulp and/or waste paper pulp with hard sizing used for making spiral or convolute winding into cores.

Core Plugs: Metal, wood, plastic, or compressed paper plugs which are driven into the paper core of the finished roll to prevent crushing of the core. Also called bungs.

Core Stock: Paper board made for use in the manufacture of cores to be used in rolls of paper, etc. The furnish ranges from screenings to special qualities of virgin pulp, depending upon size of the core and its intended use.

Core Waste: The paper which remains on the core after the roll or reel has been unwound.

Cork Paper: A cork-like sheet of paper made in a variety of ways depending on its end use. Ground cork is mixed with chemical pulps and proper adhesives and glycerin additives to make a heavy weight sheet for gasketing material. Laminates of thin cork and paper

sheets are used to make some types of paper 'tips'. An example of a product using cork is protective packing material made from heavy manila paper coated with a mixture of ground cork and adhesive.

Correspondence Cards: Generally any heavy grammage paper falling into the bristol category, which is used for personal correspondence. Such paper is characterised by a smooth finish, sized for pen and ink writing.

Correspondence Envelope: A flat case, generally rectangular in shape and made from one sheet of paper. This paper is so folded as to provide a plain front and a back consisting of four overlapping flaps. Generally three flaps (but occasionally only two) are stuck together, the fourth which may be gummed or ungummed, serves as a closure. This fourth flap may be either on the long side (banker shape) or on the short side (pocket shape) of the rectangle. The front may have a transparent window in it.

Correspondence Paper: A general term applicable of writing or typewriting papers designed for business and social correspondence, including bonds, ledgers and writings.

Corrugated Fibreboard: Board consisting of several layers of fluted paper and flat sheet of paper or board alternately stuck together with an adhesive. This has the following classification:

- a) *Single-Face Corrugated Fibreboard* — Board made up of one sheet of fluted paper stuck to one sheet of paper or board;
- b) *Double-Face Corrugated Fibreboard* — Board made up of a sheet of fluted paper stuck between two sheets of paper or board;
- c) *Double-Wall Corrugated Fibreboard* — Board composed of two fluted sheets separated by a flat centre sheet and faced on each outer surface. It is also known as Double-Double Face Board.
- d) *Triple-Wall Corrugated Fibreboard* — Board composed of four flat sheets and three fluted members combined in the following sequence — a flat sheet, a fluted member, a flat sheet, a centre fluted member, a flat sheet, a fluted member and a flat sheet.

Corrugated Sheet: A sheet of corrugated board used for many purposes where protection, separation, or support is required. It is made of double faced or doublewall corrugated board.

Corrugated Wrapping: Corrugating paper or paper board used for protection of fragile articles. It is made by passing a corrugating medium through fluting rolls of the machine without being pasted to a facing sheet. It may be joined to form a tube for bottles or light bulbs or to be used as a wrapping; it is light rigid in one direction, and serves as a cushion.

Corrugating: The process of imparting of a wavelike shape to a paper or a board. It is carried out on a

corrugating machine by moisturing or steaming a roll of corrugating medium prior to passing it between two metal rolls cut with alternate ridges and grooves which are geared to run in complement to each other. This impresses permanent parallel flutes in the paper at right angle to the machine direction.

Corrugating Media: Papers used for forming the fluted structure in corrugated papers and boards (*See* 'Fluting Media').

Corrugating Medium: A paper used by corrugating plants to form the corrugated or fluted member in making corrugated combined board, corrugated wrapping and the like. It is usually made from a combination of chemical and semichemical pulps straw or reclaimed paper stock on cylinder or fourdrinier machines.

Corrugations: Marks found in paper when wound into rolls. They are due to humidity conditions.

Cotton: A plant of the Genus *Gossypium*, which yields fibre rich in Alpha cellulose and long fibres used for the manufacture of durable and permanent fine papers and cellulose derivatives. The ball of the cotton plant is a capsule that bursts open when ripe, allowing the seed and attached lint (hairs) to be easily picked. The cotton fibre is removed from the seed by the ginning process.

Cotton Batting Paper: A lightweight blue wrapping paper used for wrapping absorbent cotton and cotton batting.

Cotton Content Paper: Paper that contains cotton fibres derived from cotton based raw material like textile waste, rags, hosiery, linters, ginning mill cotton waste, etc. The term is used interchangeably with rag content paper.

Cotton Linters: The short fibres adhering to cottonseed after the operation of ginning (seed removal and cleaning). These fibres are cut from the seed in a series of passes through cutting blades, and are therefore referred to as 'first-cut linters', 'second-cut linters', 'Mill run', etc. Linters are used in the manufacture of cotton fibre content paper and cellulose derivatives.

Cotton Linter Pulp: Pulp made from cotton linters.

Cotton Wipe Test: A superficial method of approximating the roughness of a surface over which pulp stock will flow. It consists of passing a wad of cotton over the surface and observing the number of fibres that adhere as an indication of the possible fibre hang-up when pulp stock runs over it. The test is usually done on stock handling equipment, the inside surface of pipe lines, and certain flow-through type meters.

Couch: That part of the paper or board machine at which the wet web leaves the fabric on which it has

been formed (*See* for example, 'Fourdrinier wire part and vat machine, cylinder machine').

Couch Jacket: A tubular woven thick wool felt which is shrunk onto the top couch roll. It is nearly obsolete, having been replaced by the suction couch roll.

Couch Mark: A quality defect in paper due to the mark showing the pattern of the holes of the suction couch roll. Also called Shadow mark.

Couch Pit: That portion of the white water pit beneath the wet end of a fourdrinier paper machine that is located below the couch roll end of the wire. It collects water draining from that section so that it may be returned to the white water system.

Couch Roll: A paper machine roll primarily used for dewatering and picking off, or couching of the paper web from wire and particularly dewatered and in the transfer of the web to the wet press felt for further dewatering. (a) On a cylinder machine the couch roll runs against the top of the sheet-forming cylinder mould to produce a pressure nip through which the pick up felt passes. The sheet formed on the cylinder passes up and through this nip for further dewatering by the nip pressure, is picked off the wire mesh surface of the cylinder mould by the pickup felt, and may be joined by additional plies picked up in turn from other cylinder moulds as it is transported by the felt to the wet presses. (b) On a fourdrinier machine either a suction couch roll or a pressure couch is used. The suction couch roll consists of a heavy metal shell drilled with many small holes through which a suction box inside this shell applies a high vacuum for rapid removal of water from the sheet as it is carried by the wire over this roll immediately prior to its transfer from the wire to a felt for passage through the wet presses. The pressure couch consists of a pair of rolls forming a pressure nip through which the wire and partially dewatered sheet passes for further water removal by pressure immediately prior to transfer of the sheet from the wire to the wet press felt. The two rolls involved are termed top couch roll and bottom couch roll.

Couching: Pickup of the sheet formed on the cylinder wire by a felt as the web passes through the nip made by the couch roll contacting the felt, web and cylinder face.

Count: (a) The number of sheets of paper and paper board of a given size, grammage and caliper contained in a standard unit package of a particular kind of paper or board.

Counter: A device that continuously registers single occurrences and from which a total number of occurrences can be extracted for a given period of time.

Counter Cheque Paper: A high quality paper used for printing ordinary cheques, deposit slips, etc, used within banking offices but devoid of safety features.

Counter-Current Cooking: The addition of part or all of the white liquor into the second and third zones of a Kamyr continuous digester so that liquor and chips move in countercurrent manner against each other below the second zone.

Counter-Current Washing: (a) A method of washing pulp by running the wash water countercurrent to the flow of pulp through the process. Examples include countercurrent intra-stage washing in a multi-stage bleaching process (to minimize effluent) and the countercurrent flow of wash water to pulp flow on vacuum type brownstock washers to minimise water use and maximise black liquor recovery). (b) The washing of pulp within a Kamyr continuous digester (before blowing) in which the washwater flow countercurrent to the pulp flow in the process.

Coupon Paper: A grade of high quality printing paper or paper board used generally in the form of tickets. Many of these papers possess the characteristics of safety papers.

Converture Ordinaire: Liner normally made waste paper.

Cover Paper: (a) Any of a wide variety of fairly heavy plain or embellished papers which are converted into covers for books, catalogues, brochures, pamphlets and the like. (b) A class of strong white or coloured paper in various finishes and embossings used principally for book covers.

Cracked Edge: (a) A broken edge in a paper web usually extending into the web for a short distance only. (b) The term is also applied to a similar defect in a fourdrinier wire.

Cracking: (a) Separation of the coating layer or the formation of fissures in the coating during printing or converting processes. (b) Formation of fissures in the crease when a sheet of any paper is folded.

Crash Finish: A finish on paper resembling a coarse linen finish, produced by the use of a heavy crash linen cloth in the planting operation or by embossing. Paper so finished is used for a variety of purposes such as cover, paperties, greeting card, etc. This finish is sometimes referred to as homespun.

Crayon or Pastel Paper: Cheap brown, and coloured paper of fairly heavy grammage used for drawing purpose with crayon or water colour.

Cream Laid: A smooth white laid paper usually intended for writing.

Cream Wove: A smooth white wove paper usually intended for writing.

Creasability: Physical property of paper that resists the breaking away of the surface coating along the crease on folding.

Creasing Strength: The strength of paper after being folded under specified load conditions.

Creators: A defect due to small pits in coated paper, caused by the breaking of air bubbles in the coating.

Crepe: A simulated crinkly finish effect generally produced on a sheet of tissue or lightweight paper by crowding it on a roll with the aid of a doctor blade on the paper machine (machine crepe) or during converting. *See also* All directional Stretch.

Crepe Finish: A finish produced by embossing or by using creped paper in the plaer book in the place of fabrics.

Crepe Paper: (a) A general term descriptive of paper made with an effect simulating crepe. (b) M.G. tissue, water creped (or secondary creped with the sheet set in a water solution. Additives such as dyes, sizing, adhesives and flame-resisting agents may be present. It has a wide range of uses, including decorating and craft work.

Crepe Ratio: A means or expressing the degree of crepe that exists in a sheet. It indicates the extent to which it will stretch or can be pulled out before breaking and is usually expressed in length of extension or in percentage.

Creped Duplex Kraft Paper: A duplex sheet composed of two layers of creped kraft laminated to each other with asphalt or other material which is used by nurseries for wrapping roots of nursery shrubs, for wrapping metal parts for export, and as liners for shipping cases. The product may be made by using machine-creped kraft then laminating, or laminating flat kraft and creping in a secondary operation.

Creped Kraft Paper: A bleached or unbleached kraft paper in various grammage and with various percentages of stretch, used for wrapping purposes, for bag and barrel liners, and for other converted paper products. It may be creped on the paper machine or in a secondary operation.

Creping: The operation of crinkling a sheet of paper to increase its stretch and softness.

Creping Tissue: A dense, well-formed, strong Yankee machine tissue paper having a high M.G. finish, and suitable for the manufacture of water-creped in a separate converting operation.

Crill: Very small pieces of fibre that occur on the surface of the pulp and which are rubbed off during the refining process.

Crimp: (a) To crease or break the grain in a sheet of paper so that it will lie flat, as to crimp the binding edge of sheets for looseleaf binders. (b) To crepe. (c) The rolling of the edge of a sheet of paper or paper board.

Crinkle: (a) A simulated finish effect similar to crepe, expect that it is produced on heavier papers. (b) A

property of paper that allows it to be stretched in both directions.

Critical Angle: Maximum angle, measured from the perpendicular, at which refraction takes place when light rays pass from medium of higher index of refraction to one of lower index. It is also the minimum angle at which total internal reflection takes place under those conditions. The phenomenon is used in a method of measuring liquor density.

Critical Speed: The speed at which rotating shafts or tubes will tend to vibrate excessively in a transverse direction. Also referred to as whirling speed or whipping speed.

Crocking: Rubbing off a dye or pigment from the surface of paper and paper board.

Crop Fibres: Pulp and paper making fibres derived from nonwoody plant species, like baggase, rice and wheat straw, Mesta, Kenaf, etc. Sometimes also referred to as 'annual crop fibres' or 'Agricultural Residues' or 'Annual Crop fibres'.

Cross Cutter: A type of paper-cutting machine designed to cut rolls of paper into sheets of specified lengths, suitable for the intended end use.

Cross Direction: The direction of the paper at right angles to the machine direction (q.v.).

Cross Flow Distributor: A type of paper machine headbox stock inlet in which the delivering of stock is made at the sides of the machine, perpendicular to the machine direction.

Cross Laminated: Laminated with some layers of materials at right angles to the remaining layers with respect to the grain direction or strongest direction of the sheet.

Cross Recovery: The practice of recovering chemicals from a sulphite or neutral sulphite semichemical process spent liquor together with sulphate process spent liquor in a sulphate recovery system when the two process are associated with each other.

Crown: The difference in diameter between the centre and ends of a press roll or calender roll necessary to allow for deflection so that the nip pressure will be uniform over the full width of the press or calender. The increase in diameter of the centre over the ends expressed in thousandths of an inch of mills, is called the crown of the roll.

Crown Face: The axial distance over which the crown of paper machine rolls is measured.

Crown Face Centerline: The centerline of the crown face of the paper machine roll which is normally the centerline of the machine, except of the suction press roll where it is centered on the drilled portion of the shell.

Crown Filler: A hydrated calcium sulphate ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) prepared by the interaction of calcium chloride and sodium sulphate. It is used particularly in high grade papeteris, where a high white colour of delicate tint is desired. It is also known as pearl hardening. This has been replaced largely by calcined calcium sulphate.

Crushed: Having the formation broken by Crushing (q.v.).

Crushed Core: A paper roll core which has been crushed.

Crushed Finish: (a) A mottled effect intentionally or unintentionally produced by crushing the paper at the wet end of the paper machine so that the paper has a lumpy formation and a mottled finish. (b) A coarse ripple finish applied by a plaster press or by embossing.

Crushed News: Old newspapers which have been baled indiscriminately, as distinguished from flat or overissue news. It is the same as bundled news.

Crushed Roll: A roll of paper which has been flattened through pressure or by dropping it.

Crushing: Defect in paper, in the form of a local clotting caused by disturbance of the formation of the already formed wet web by pressure or excessive moisture at the wet end.

Culls: Paper that does not meet manufacturing specifications and is sold as a lower quality product or returned to the papermaking process for recycling.

Cultural Papers: A term applied to papers such as writing and printing used for cultural purposes.

Cunit: A term used in the measurement of pulpwood that is 100 Cubic feet of solid wood, excluding bark. A Cunit may be obtained from $2/3$ to $1\frac{1}{3}$ cords of wood depending on size, piling and bark.

Cup Board: A paperboard made on either a fourdrinier or cylinder machine and used to manufacture cups of a nested style, constructed with an tapered or sloping sidewall. The board is usually manufactured of bleached chemical pulp and is hard sized. Folding, beading and crimping characteristics are important. Cups fabricated from this board are used for hot and cold drinks and in the packing of moist, liquid and oily foods.

Cup Paper: A type of long-fibred bleached kraft or sulphite paper suitable for making cups. The paper is hard sized with rosin and is coated with paraffin or the complete cup is dipped in wax, the weight of the coating depending upon the purpose for which the cup is intended. It has the strength characteristics necessary for crimping, folding and beading.

Cuprammonium Hydroxide: A standard paper mill laboratory solution of ammonium hydroxide and cupric hydroxide which is used to dissolve cellulose

in pulp samples to determine its viscosity as a measurement of the quality of the pulp.

Cupramonium Viscosity: The viscosity measurement of dissolved cellulose in cuprammonium hydroxide solution under specified test conditions. It is indicative of cellulose chain length and the quality of the pulp.

Cupriethylenediamine Hydroxide: A standard paper mill laboratory solution of cupric hydroxide and ethylenediamine which is used to dissolve cellulose in pulp samples to determine its viscosity as a measure of the quality of the pulp.

Cupriethylenediamine Viscosity: The viscosity measurement of dissolved cellulose in cupriethylenediamine (C.E.D.) solution under specified test conditions. It is indicative of cellulose chain length and the quality of pulp.

Curing Box Liner: A vegetable parchment paper, which may be plain or crinkled, in grammage of 49 to 65 g/m² which is used to line a picking box (holding about 272 kg of meat with various ingredients for the pickling process).

Curl: Deformation of the surface of paper or board, which tends to roll up into the form of a cylinder.

Curl Test: A method of testing the sizing of paper based on the fact that when paper is floated on water the edges curl upward, and the axis of the curl will indicate the grain of paper.

Currency Paper: Paper used for printing paper currency, bonds, and other government securities. It may contain distinctive features like intricate water marks, localised band of silk or metallic fibrous threads, etc, to protect against counterfeiting. Significant properties are quick and uniform wettability, adaptability to printing by the intaglio process, high tensile strength and folding endurance and resistance to wear.

Curtain Coating: Applying a paint or plastic coating to a sheet or board which is moving through a continuous flowing curtain of the coating material. The coater may be of gravity or pressure types. Coating films can be varied by adjusting the machine speed and curtain thickness.

Cut Cards: Small sizes of cards and tickets in certain standard sizes and shapers, in distinction from cardboard in large sheets. They are used for personal and business cards and for advertising purposes.

Cut Scored: A method of scoring paper board in which the outer surface is cut by a scoring knife so that the sheet will fold sharply on the score line. It is frequently used in the manufacture of setup cartons, and the surface of the board and scores will be covered by an overwrap.

Cut to Register: The cutting of a watermarked paper so that the design falls in a given position in each sheet.

Cutoff Squirts: Fine jets of water directed onto the paper machine wire with enough force and located on each side, to cut the wet web to correct width. Generally one squirt is made adjustable so that it can be gradually fed across the wire to form a tail or lead strip on the wet sheet to facilitate feeding it to the wet presses and through the dryers.

Cutter Broke: Trimmings and the waste made during the cutting operation.

Cutter Dust: Small particles, fibres and mineral coating chipped off during the cutting operation, which may adhere to the edge of the sheet and work their way inside the pile of paper, causing printing difficulties. Generally it occurs when the cutter knives get blunt.

Cutter Set: A number of rolls of paper that are matched and put on the sheet cutter so that an equivalent number of sheet is cut simultaneously.

Cutting: Converting paper or board reels into sheets.

Cutwater: The point at which water flowing around the perimeter of a pulp casing is forced to travel towards the pump discharge.

Cycle: As an electrical term, it represents one complete set of positive and negative values of an alternating current.

Cycloidal Vacuum Pump: A type of vacuum pump used on a paper machine vacuum system that is constructed with two lobe-type impellers which rotate in opposite directions, entrapping and expelling a volume of air directly proportional to the pump rotation.

Cyclone Cleaner: A pulp stock cleaner in which low consistency slurry is tangentially injected into a truncated, cone-shaped vessel to produce a rapid whirling action of the suspension, causing a centrifugal force that moves the heavier particles towards the wall where they travel down and are removed. The inner vortex column with the acceptable fibre moves to the top where it is removed for further processing. Also called a vortex cleaner.

Cyclone Evaporator: A type of evaporator used to concentrate sulphate black liquor before burning in a recovery furnace by spraying partially evaporated liquor through tangential nozzles into a cyclone, with hot gases being introduced at the bottom.

Cyclostyle Process: A process for making duplicate copies in which a stencil is made by writing or drawing with a pen having at its end a small wheel which makes minute punctures in the stencil paper. Duplicate copies are made by transfer of ink from a small roller through the stencil to the underlaying paper.

Cylinder Board: Any board made on a cylinder machine.

Cylinder Bristols: This term is applied to any bristol made on a cylinder machine.

Cylinder Dried: Dried by passing over internally heated iron rolls. Also termed machine dried.

Cylinder Mould Machine: One of the principal types of paper making machines, characterized by the use of wire-covered cylinders or moulds, on which a web is formed. These cylinders may be partially immersed and rotated in vats containing a dilute stock suspension or may be equipped with a headbox or other apparatus for distributing the stock. The wet sheet is couched off the cylinder on to a felt which is held against the cylinder by a couch roll. A cylinder machine may consist of one or several cylinder moulds, each supplied with the same or with different kinds of stock. In the case of the multi-cylinder machine, the webs are successively couched one upon the other before entering the press section. This permits wide latitude in thickness or grammage of the finished sheet, as well as in the kind of stock used for the different layers of the sheet. The press section and the dry end of the machine are essentially the same as those of other types of machines.

Cylinder Mould: The complete piece of equipment that rotates in the cylinder vat. It is composed of the shaft, the supporting frame, and the wire covering. As the mould rotates, the pulp fibres cling to the wire and are carried upward to contact with the felt. Suction, derived in the vat by the difference in level or the stock inside and outside the mould, regulates the flow and together with the speed and character of the stock, governs the thickness of the web that is formed.

Case Liner: A waterproof bag made to slip inside a rigid container and, after sealing, provide waterproof protection of contents.

Chalk Paper: A paper used to wrap chalk or crayons to protect the hands from soiling. In most cases a coloured paper is used which is light enough to confirm to the chalk, there are no definite specifications.

Composite Container: A container which employs different materials or its main structural parts including the ends.

Composite: A container with walls based on a fibrous material, for example, pulpboard, and having two ends of metal.

Crease Carton: An indentation in the board to give the line of fold.

Crimp Wrapping: A method of wrapping in which the wrapper is heat-sealed and crimped at both ends by serrated dies which are heated by electric cartridge heaters. It is suitable for any heat-sealable wrapping material.

Cutter: A machine for cutting a web of paper into sheets of desired length. It is also called cross cutter. Some cutters have one pair of rotating knives. They

are called also 'Simplex Cutter'. Some machines have two pairs of knives, hence called 'Duplex Cutters'. In the latter case, sheets with two different lengths in the machine direction can be produced at the same time.

D

Dam: (a) An adjustable baffle board extending across the full width of a pulpwood grinder over which pulp flows to the grinder ditch. It is raised or lowered to control pulpstone immersion. (b) A barrier constructed across a water stream (for example river) to confine the flow and create a depth or head that could be used to drive electric generators which can provide power for pulp and paper mills.

Damp Streaks: Crushed or blackened streaks running in the machine direction.

Damper: (a) A manual or motor driven, plate-like valving device usually used in air-ducted lime kilns, furnaces, etc, to control the air flow through them. (b) Water or steam spray used on a sheet of paper as it enters the calender stack to moisten it in order to achieve a higher finish.

Damping Roll: A type of roll usually located just ahead of a coater or at the end of a paper machine. It is used to cool the sheet by being operated at a temperature that is low enough to cause moisture to condense on its surface and slow up the drying.

Damping Stretch: The change in the dimensions of a sheet of paper when it is dampened or moistened.

Dandy Blisters: Paper blemishes that have the appearance of blisters and have been pressed down on the surface of the sheet, causing concentric wrinkles. This condition is brought about by the dandy roll becoming filled up on various spots.

Dandy Crush Marks: Paper defects having a curdled appearance, spread over the surface of the sheet. These defects are caused by too liberal use of water on the dandy roll, with the roll wading in water which cannot normally drain through the sheet.

Dandy Mark: Mark caused by the dandy roll picking up fibres from the sheet of otherwise disturbing the sheet formation, to leave thin spots or other imperfections. Sometimes called Dandy pick.

Dandy Pick: The lifting or picking up of fibres from the wet paper web by the dandy roll, causing thin spots in the sheet. *See* Dandy Mark.

Dandy Roll: A skeleton roll, covered with wire cloth and supported above the fourdrinier wire and riding on the wet web or paper of a fourdrinier machine at a point near the first suction box for the purpose of marking the sheet with a design carried on the surface of the roll. The arrangement of the wires of the dandy determines the wove or laid effect of the sheet. When letters figures or other devices are worked in wires on

the surface of the roll, a watermark is produced. A roll carrying such figures or devices is known as a watermarking dandy. Originally the dandy roll was driven by the fourdrinier wire. With the advent of higher speeds it became an accepted practice to put a separate drive on the roll to eliminate drag and resultant distortion of the mark. Presently plain dandy rolls are used quite extensively to level the surface and improve or assist in formation.

Data: Any process or off-line information with particular reference to that which can be processed or produced by a computer or control system.

Dead Brand: The range of a controller through which a signal or action can be varied without initiating any response.

Dead Finish: A smooth finish without glare.

Dead Spots: Low-finished areas in a highly finished paper.

Dead Steam: Steam that has completed work. Sometimes called exhaust steam.

Dead Time: The interval of time between the initiation of a signal or action change in a controller and the start of the resulting response or any definite delay between two related action measured in units of time. Also known as process lag.

Dead Zone: A zone within the range of a controller in which no value or output or response exists regardless of the change in a signal or action.

Deadening Felt: A dry felt used by the construction industry in walls and floors to deaden sounds and to keep out drafts. It is made on a cylinder or fourdrinier machine and may contain from 50 to 70 percent of roofing rags and from 30 to 50 percent of news or mixed papers rags being replaced to a certain extent by defibrated wood; it is lightly calendered. These felts are made usually in three grammages, of approximately 435, 540 and 815 g/m² although lighter and heavier weights may be made on demand. The caliper of the two heavier weight will range from 1 400 to 1 525 µm and from 2 080 µm to 2 210 µm. These felts are firm, pliable, durable, free from lumps, and process a smooth surface.

Deaeration: (a) The process of removing free air in stock slurries by the use of vacuum, usually prior to the headbox of a paper machine, to minimize foaming and slime problems and improve the drainage and sheet formation. (b) The driving off of entrained gasses from condensate going to the feedwater pump of a boiler by heating to saturation, using steam.

Deaerator: (a) A unit where condensate trickles over a large series of baffles and is heated to saturation by the admission of steam, which causes entrained gases to boil off. Also called direct contact (DC) heater for direct contact heating of the feedwater by steam. (b) A large vessel under vacuum, located just ahead of the

wet end of a paper machine, through which the stock slurry is passed to remove entrained air.

Dealkalization: The removal of bicarbonates and carbonates from boiler feed water.

Debarking: The process of removing bark from logs or from the tree.

Debris: The result of external fibrils rubbing off the surface, and parts of the wall being removed from the fibre during beating and refining. It determines the characteristics of the produced pulp stock, such as freeness, specific surface, and coarseness.

Debug: To detect, locate and remove mistakes from a program or malfunction from a computer.

Decalcomania Paper: An absorbent paper made of cotton fibre mixed with chemical pulps or of chemical pulps alone, having a smooth, uniform finish and formation with a good wet strength. It is usually made without sizing and in a light-natural colour. The base paper is coated with a solution of gum arabic and strach in water (the decalcomania solution). The finished paper is of two types; simplex or single — absorbent paper stock coated with the decalcomania solution; duplex or double-heavy backing paper or which is laminated a very high grade of thin or tissue paper, on which in turn is coated the decalcomania solution which is to receive the printed impresssion. The heavy backing paper serves to give support to the tissue sheet as it goes through the press and in the placing of the printed design in its proper position on the object. It is used in the manufacture of ceramic or mineral transfers, for curved surfaces, and for very fine lettering.

Decantation: A unit process utilized in the clarification of green and white liquor in the causticizing operation. It is accomplished in a multi-compartment settling tank in which solids are allowed to settle and clear liquor is decanted off in each sector. Synonym of clarification.

Debenture Paper: Bond paper used in the form of an official document. The usual furnish is cotton fibre which may also be mixed with bleached chemical pulps. Good strength and permanence are desirable and significant properties.

Deciduous: A term applied to a tree which loses its leaves annually. These are usually broadleaf or hard with trees. Most species of board-leaved dicotyledonous trees in the temperate zone have this characteristic. Opposite of evergreen.

Decker: A drum vacuum filter used to thicken pulp slurries for increased fibre storage and to produce filters for reuse in the process.

Deckle: A term indicating the width of the web which is formed on the machine.

Deckle Board: Stationary equipment for retaining laterally the stock on the wire during the early part of drainage. This equipment can be adjusted laterally to obtain the required width of the web on the fourdrinier wire part.

Deckle Edge: The untrimmed feather edge of a sheet of paper formed where the pulp flows against the deckle. This edge may also be produced by means of a jet of water or of air. Generally speaking, handmade paper has four deckle edges and machinemade paper has two; however, by the use of a certain patented procedure, a machinemade paper may be manufactured with four simulated deckle edges. An 'imitation' deckle edge is one which is produced on a dry sheet of paper by such means as tearing, cutting with a knife which will give a deckle-edge effect, sand blasting, sawing, etc.

Deckle Edge Paper: A term most often applied to sheeted fine writing and papeteries having deckle edges on one more sides.

Deckle Frame: (a) In handmade papermaking, the removable, rectangular wooden frame that forms the raised edge to the wire cloth of the mouldend holds the stock suspension on the wire. (b) On a fourdrinier paper making machine, the arrangements on the side of the wire which keep the stock suspension from flowing over the edges of the wire. The stationary arrangement is a mechanical device for holding a thin and flexible strip of rubber or equivalent material on top of the wire and just inside the wire width. This rubber strip restricts the pond or sheet to a chosen width during the period of sheet formation and therefore varies in its length on different machines. The ruler or rubber strip is made so that its contact with the wire may be vertical or at an angle and in some cases, the strip is 'showered'. As a general rule, deckle rulers are mounted in a fixed position and do not oscillate with shaking fourdriniers. For this reason, pressure of the stationary rubber blade against the travelling wire varies with the stock length of ruler, etc. The moving arrangement is a pair of deckle straps which are endless and lie on the wire at its edges while moving with it. They retain the pond on a shaking fourdrinier and in following the wire minimize 'slap' or edge ridging which may occur with the deckle rulers. By travelling at the speed of the wire they also eliminate the tendency for the stock to roll and 'ball up' at the wire's edge. As machine speeds have increased, the deckle straps are no longer used, but have been replaced by deckle boards and on lightweight sheets by deckle showers only. (c) On a cylinder machine, the canvas webbing would around the cylinders at their ends to control the width of the sheet.

Deckle of Suction Box: Stationary equipment used inside suction boxes to restrict the suction area to the

width of the web. This equipment can be adjusted laterally to conform to the width of the web.

Deckle Straps: Endless belts, generally rectangular in cross section, that move with the wire and serve the same purpose as deckle boards (*see* 'Deckle board').

Decomposition: Reduction of the net energy level and change in chemical composition of organic matter because of the actions of aerobic or anaerobic micro-organisms.

Decorative Laminate: A laminated structure made by heating and pressing together an assembly comprising of fibrous sheets (core sheets) impregnated with a thermosetting resin, such as phenol-formaldehydes, melamine formaldehyde, or urea formaldehyde, and a decorative or 'print' sheet containing an impregnating resin such as melamine-formaldehyde. In some cases the print sheet is itself covered by an overlay paper (q.v.) containing an impregnating resin that becomes clear and transparent during the laminating operation. During the laminating operation heat and pressure cure the impregnating resins, and the whole assembly is consolidated into a unitary article.

Deed Paper: Bond paper used in documents such as deeds. The usual furnish in cotton fibre which may also be blended with bleached chemical pulps. The paper is generally surface sized. Permanence and durability are significant properties.

Deep Fozen Food Packs (Base Paper for): Paper or board, free from contaminating ingredients, of high mechanical strength at normal and at low temperatures suitable for further processing to produce wrapping or packing materials with the necessary characteristics such as grease resistance, water vapour proofness and sealability. Paper or board having high mechanical strength at low temperatures and at high humidity suitable for processing into packaging materials for storing already protected frozen or deep-frozen foods.

Defective Slitter Edge: A rough, irregular roll, edge which may have a nicked or torn edge are excessive slitter dust.

Defibrated Pulp: Pulp made by mechanically reducing chips into their fibre components at elevated temperatures, usually after presteaming in a preceeding chamber.

Deflaker: A high-speed mixer or agitator through which a fibre-water slurry is pumped to break up any fibre lumps or bits of underfibred paper, and to obtain complete separation of individual fibres.

Deflocculation: The chemical or mechanical breaking up of agglomerated substances in slurries in such a way that the particles produced will stay in suspension by repelling each other.

Defoamer: (a) Meterial such as kerosene, fatty acids, fatty alcohols, and other hydrocarbons added to an aqueous solution to prevent the accumulation of air

bubbles by bursting them and releasing the air before they can form foam. (b) A mineral such as bentonite or diatomaceous earth added to pulp stock furnish to prevent the formation of foam that may cause foam marks in the paper sheet. Also *see* 'Anti Foaming Agent'.

Degradation: In general chemical use, the conversion of a complex compound to a simpler form. Specifically for cellulose, the break-down of the polymer chain, usually by hydrolysis or oxidation. Degradation is usually applied to changes in chemical structure.

Degreasing: The process of removing greases and oils from mill sewage, waste, and sludge.

Degree of Incombustibility: Degree to which a paper or board resists being consumed when heated in the presence of air under specified conditions of test.

Degree of Non-combustibility: Degree to which a paper or board resists being consumed when heated in the presence of air under specified conditions of test.

Degree of Non-flammability: Degree to which a paper or board resists flaming when burnt.

Deinked Paper Stock Pulp: Pulp made from deinked printed paper using a combination of mechanical disintegration and chemical treatment.

Deinking: The processing of printed and other used, reclaimed waste-paper by mechanical disintegration, chemical treatment, washing, and bleaching in order to remove ink and other undesirable materials so that it can be reused as a source of papermaking fibre.

Deionization: The removal of ionized solids, especially from boiler feedwater. Process is also called Demineralisation, where all metals and dissolved salts are removed to make water pure.

Delignification: The process of removing lignin from wood or other cellulosic material by means of chemicals, leaving a residue of cellulose, hemicelluloses, and other carbohydrate material.

Delivery Table: The table portion of a paper cutting machine on which the sheets are automatically stacked after cutting. Also called a lay boy.

Demand Factor: The ratio of the maximum demand of an electrical system or part of the system, to the total connected load of the system, or part of the system, under consideration.

Demineraliation: Removal of mineral contaminants from water, such as that used for feedwater to a boiler. *See* 'Deionization'.

Demy Scale: A quadrant scale for ascertaining the ream weight in the Demy size by weighing a small sample piece cut to a given size.

Dennison Wax: Specially made and patented hard resin, non-oily wax sticks, numbered according to their adhesive power, and commonly used in

paper-testing laboratories to measure paper surface strength. The testing is accomplished by softening the sticks with heat and apply them to the surface to determine the highest number which does no rupture the surface.

Density: Weight per unit volume. Density should not be confused with porosity.

Densometer: A paper laboratory tester used to measure the porosity of paper as the time required for a standard volume of air to penetrate through a standard area of paper.

Deodorants: Pleasant smelling substances added to pulp mill gaseous emissions to mask unpleasant odour.

Deposits: A very broad term used in the pulp and paper industry that encompasses aggregations of all types of undesirable accumulations anywhere in the process, such as slime, pitch, scale, foam, dirt size, alumina gel, etc.

Design Paper: Any paper with a special design marked therein. This type of paper is used for making various types of bags and also as an all-purpose wrapper in department, drug, and notion stores. It is made in grammage of 40 g/m² to 47 g/m². The paper usually has an M.G. finish and is made in as assortment of colours. Visual properties are most significant.

Design Printing: A process of immersing a sheet of paper in a colour solution and subsequently passing it between design-marked rollers, so that the design stands out heavily coloured or printed against the lighter background of the same colour. Gift wrapping paper may be made in this manner; also much safety paper.

Desuperheater: A unit used to reduce the temperature of water-heated steam from a boiler by the injection of atomized water or a heat exchanger located in the bottom half of the drum, through which steam is bypassed. Same as attemperator.

Detail Drawing Paper: A sketching paper used by artists, engineers, draftsmen, etc, for preparing preliminary drawings. This usually made from strong chemical pulps in white or cream sheet. It is characterised by good strength, durability and erasability.

Detector Papers: Especially impregnated papers used to detect the presence of gases, acids, etc.

Detergent: A synthetic washing agent, sometimes used to clean paper machine felts, that acts like soap by lowering the surface tension of water and holding dirt in suspension.

Developing Paper: A general term for all photographic developing-out papers. They are treated with an emulsion which is sensitive to light and requires the use of chemicals to make the image visible and permanent.

Device: Any apparatus or piece of equipment that performs a specified function.

Dewater: (a) To extract a portion of the water present in a sludge or slurry. (b) To drain or remove water from an enclosure. A river bed may be dewatered so that dam can be built in the dry; a structure may be dewatered, so that it can be inspected or repaired.

Dextrin: A carbohydrate produced from starch by hydrolysis with acids, enzymes or dry heat. It is a white or yellowish white powder soluble in water or alcohol and used as an adhesive in envelopes gummed papers and tapes, etc.

Dialdehyde Starch: Organic compounds formed by the oxidation of a polysaccharide (starch). Among the uses of these compounds are the insolubilization of casein and other protein adhesives, improved wet end dry strength of paper and improved wet rub resistance of coating binders.

Dialyzing Vegetable Parchment Paper: A special vegetable parchment used as a membrane in the dialyzing process.

Diaphragm Screen: A type of screen once used extensively in the pulp and paper industry to clean stock. It was also called a flat screen because it consisted of perforated screen plates laying in the same horizontal slightly inclined plane to aid stock flow over them.

Diatomaceous Earth: A special type of clay suitable as filter medium used for filtration of effluents from secondary and tertiary treatments, particularly when a very high grade of water for reuse in certain industrial purposes is required; also used as an absorbent for oils and oily emulsions in some wastewater treatment system.

Diatomaceous Silica: An amorphous silica formed from the residues of aquatic plants known as diatoms. It is used as a dulling or flattening agent in coating and as a filler in paper. Also known as diatomaceous earth, diatomite, infusorial earth, and kieselguhr.

Diazotype Base Stock: A special paper designed for light-sensitive diazotype 'whiteprint' coatings. It is usually made of chemical pulps and is characterized by heat stability, chemical purity, good physical strength, cleanliness and brightness.

Diazotype Paper: A paper coated with light-sensitive diazo compounds and uses in certain office and engineering machines of the 'direct-print' type. Also called whiteprint paper.

Die: Various devices for imparting a desired shape, form, finish to a material, or for impressing an object or material.

Die Cut: The process by which paper or board is cut or stamped out to a specified shape or size by means of a steel die.

Die-wiping Paper: (a) A paper used in the printing trade for wiping the surface of printing plates. It is a well formed sheet made from unbleached or semibleached sulphite or kraft or mechanical pulp or mixtures of these. It usually has a high finish (Water finish machine glazed, or supercalendered) and a smooth surface. It is supplied in rolls of various widths and diameters. Significant properties include sizing, strength, finish (free from fuzz or lint) and the absence of abrasive particles. (b) A relatively absorbent paper made of mechanical and chemical pulps which is machine creped and lightly calendered.

Dielectric Constant: Ratio of capacitance produced by a material between the plates of a condenser to the capacitance produced by vacuum in the same condenser. It is used as an indication of the nonconductance of direct electric current in paper used for electrical insulation and in condensers.

Dielectric Paper: A paper substantially free from metallic or other impurities which are capable of conducting electricity; it is used as dielectric material.

Dielectric Strength: That property of a material which resists the passage of electrical spark discharge. Specifically, it is the potential difference (in volts) at which a spark passes through a specimen of specified thickness under specified conditions; it is usually expressed as a voltage gradient in volts per mil thickness. This property should not be confused with dielectric constant (specific inductive capacity).

Differential Pressure: (a) The difference between pressures existing at two points in a system which permits mass flow between those points, such as in condensate removal from paper machine dryers. (b) The basic principle used in making many process fluid flow measurements throughout the mill.

Differential Winder: A type of paper winder used in a paper mill. Its gears are designed so that it will allow the simultaneous winding of different size rolls with the same peripheral speed.

Diffuse Blue Reflectance Factor (ISO Brightness): For white and near-white papers and pulps the reflectance factor relative to a perfect reflecting diffuser at an effective wavelength of 457 nm as determined with an instrument employing diffuse illumination and normal viewing.

Diffuser: A large tank with a false bottom screen plate, constructed for the drainage of cooking liquor from pulp. It is also used to wash pulp with fresh water.

Diffusion-Transfer Base Stock: A paper having excellent formation, a high degree of wet strength and a very smooth surface for the effective application of a silver halide-gelatine emulsion. It is made of a very pure stock free from iron, copper and sulphur and is resistant to yellowing when exposed to a caustic

solution. It may be highly fluorescent. It is converted into copying paper for office reproduction.

Diffusion Washer: A pulp washer used to wash brownstock and interstage pulp during bleaching. It utilizes the principle of diffusion or displacement of liquors with wash water to remove the liquor.

Digested Sludge: Waste water of effluent sludge digested under either aerobic or un-aerobic conditions until the volatile content has been reduced to the point at which the solids are relatively non-putrescible and inoffensive.

Digester: A cylindrical or spherical vessel used to treat cellulosic materials with chemicals under elevated pressure and temperature, so as to produce pulp for papermaking. It may be designed for either batch or continuous operation, and may be stationary or may rotate around its long axis or tumble over end.

Digester Blow Valve: A handwheel of motor-driven valve located at the bottom end of a batch digester, which is opened at the end of each cook. The cooked chips are discharged through it into the blow line and blow tank by virtue of digester pressure.

Digester Capping Valve: A large automatically operated, rotary-or gate type valve, located over the top opening of a batch digester head through which the chips are loaded. It is then closed tightly to contain the pressure during the cooking operation.

Digester Cover: The metal-flanged cover over the top of a batch digester head which is opened or taken off while the chips are loaded into the digester. It is then bolted to seal in pressure during the cooking operation. Also referred to as the digester cap and digester lid.

Digester Head: The structure over the top opening of a batch-type digester, through which the chips are loaded into the digester.

Digester Liquor: Cooking liquor as it exists in the digester during the cooking operation.

Digester Neck: The narrow, cylindrical section of a batch digester, located in the upper feed section just below the head and above the main body section.

Digester Relief: Gases (and sometimes liquor) released from the top of the digester and sent to a by-product or reclaiming system, depending on the type of digester.

Digester Side Relief: Digester liquor withdrawn by a side relief from the upper section of a batch digester in the earlier part of the cooking operation, and returned to storage (accumulator) to conserve sulphur mainly containing chemicals and heat.

Digital: Pertaining to quantized signals or data which may be expressed in the form of digits.

Digital Computer: A computer that performs arithmetic and logic computations on discrete data.

Dilution Factor: Kg of water put into the liquor system per kg of air-dry pulp during the washing operation in a pulp mill.

Dimensional Stability: That property of a sheet of paper that relates to the constancy of its dimensions, especially as they are affected by changes in moisture content, with compressive or tensile stresses or with time under stable ambient conditions.

Dimethyl Sulphide: A compound $(\text{CH}_3)_2\text{S}$ which is a colourless flammable liquid with a disagreeable odour. Found in the relief gases in sulphate pulp making. The compound is very poisonous and is air pollutant.

Dimethyl Sulphoxide: $(\text{CH}_3)_2\text{SO}$. A water-white, highly polar, water-miscible, hygroscopic organic liquid commonly referred to as DMSO. It is a byproduct of sulphite pulping and is used for various industrial purposes as a solvent, reaction medium and chemical reactant. It also has been used experimentally for certain medical applications.

Dippers: Pipes installed inside slow speed paper machine dryers, attached to the dryer head, and arranged to remove condensation as it is formed in the dryer.

Direct Contact (dc) Heater: A unit used to heat condensate feedwater by direct contact with steam, which also drive out entrained gases. Also called a deaerator.

Direct Contact Evaporator: Type of black liquor evaporator used just ahead of the recovery furnace that concentrates the liquor by removing water through direct contact with the hot furnace flue gases like the Cascade and Cyclone evaporators.

Direct Countercurrent Washing: A pulp washing procedure used in a multi-stage bleach plant in which the filtrate from one pulp washer is used in the previous washer and runs countercurrent to the flow of pulp through the washing or bleaching system.

Direct Current: A uni-directional electrical current or nonpulsating current.

Direct Drive: A type of equipment drive in which the motor and the equipment it drives are connected through a coupling without gears or auxiliary apparatus.

Direct Dyes: A class of aniline dyes, also called substantive dyes, which have a high affinity for cellulose. They are characterized by a high level of light fastness.

Direct Process Paper: A paper used for direct process reproduction (frequently known as diazo process) which is made from bleached chemical pulps, although some may contain 25 to 50 percent cotton. The paper must have a very uniform formation, freedom from impurities especially iron, extremely hard sizing, low pH (4.5) and a high finish. It must also have good fold, tear, opacity, and brightness. The

paper is tub sized (with starch) and is calendered before and after sizing. A certain degree of wet strength is desirable, although the wet tensile strength and wet rub resistance are not as important as in blueprint papers.

Direct Steamed Digester: A batch-type digester in which chips are cooked by injection of heating steam directly into the digester body.

Direction: Paper and paperboard dimensions running parallel to the paper machine (machine direction) or at right angles to it. (cross direction).

Directional Blue Reflectance Factor: For white and near-white papers and pulps the reflectance factor relative to a perfect reflecting diffuser at an effective wavelength of 457 nm as determined with an instrument employing illumination at 45° and normal viewing.

Directory Paper: A lightweight printing paper designed for the printing of telephone directories, catalogues, and similar products. It is usually made from mechanical, chemical or reclaimed pulps. It is characterised by good printability, high opacity, and moderate physical strength.

Dirt: Any foreign matter embodied in a sheet of paper, paperboard, or pulp which has a marked contrasting colour to the rest of the material when viewed by reflected or transmitted light. In paper it is generally determined by reference to a standard dirt chart.

Dirt Count: It is indicative of foreign matter present in pulp and is reported in terms of the square millimetres of equivalent black area of dirt per square metre of surface examined.

Dirty Blow: When a batch digester is discharged into a blow tank with uncooked chips and pulp remaining in the bottom of the digester or in the blow tank.

Dirty ID Fan: An Inducted Draft fan on a pulp mill recovery furnace located after the precipitator.

Disc Save-all: A process unit used to remove fibres from white water by filtering it through a series of rotating, circular, flat screening elements. Sometimes called a disc filter.

Discharge Head: The pressure generated by a pump.

Discolouration: Unintended alteration in the colour of paper, for example, by the action of light or air.

Dishing: A condition of paper in piles, in which the sides are higher than the centre of the pile.

Disinfection: The killing of large portions (but not necessarily all) of the harmful and objectionable microorganisms in or on a medium by means of chemical, heat, ultraviolet light, etc, or the use of a chemical additive and other treatment to reduce the number of bacteria, particularly pathogenic organisms in mill supply and wastewater.

Disk Refiner: A refiner (q.v.) whose working elements consists of one or more matched pairs of disks having a pattern of ribs machined into their faces and arranged so that one disc of the pair is rotated. The other disk is usually stationary but may be driven in the opposite direction of rotation. Precision controls are provided for adjusting the clearance between the disk faces and applying pressure between them. The disks are enclosed in a case arranged so that a suspension of paper stock can be pumped in and caused to flow radially from the center out, or *vice versa*, between the rapidly moving ribbed surfaces of the disks, thus resulting in refining action on the fibre material.

Disperse Viscosity: A viscosity measurement made on a pulp, usually by means of a falling ball of billets, after it has been dissolved in a solvent such as cupriethylene-diamine.

Dispersibility: The comparative ease and/or completeness with which coating pigments are resolved into their individual discrete particles in a coating colour.

Dispersing Agent: Any material added to a suspended medium to promote the separation of the individual extremely fine particles of solids, which are usually of colloidal size. Typical applications of dispersing agents include their use in grinding of pigments for fine enamels and dispensing, of certain water insoluble dyes to secure uniform dyeing. The term is often interchangeable with emulsifying agent or emulsifier.

Displacement Bleaching: A type of pulp-bleaching process in which the chemicals are displaced through a pulp mat, rather than being mixed into the pulp. This provides a more rapid bleaching operation. Some times referred to as diffusion bleaching or dynamic bleaching.

Displacement Pressing: A relatively new concept in pressing based on the displacement of liquid (water) in the sheet with pressurized air or gas (heated), together with conventional pressing principles, in order to increase sheet dryness levels out of the press section to 65 percent or more.

Displacement Ratio: In the washing of pulp in filters, it is the ratio between the recovered solids in a volume corresponding to the liquor volume of pulp leaving the washing operation and the solids in a corresponding volume of liquor entering it. It characterises the efficiency of the washing process.

Displacement Washing: Method of washing pulps in which the cleaning is done by displacing liquors or chemicals from a thickened mat with the washing medium.

Dissolved Oxygen: Amount of oxygen, expressed in parts per million, dissolved in water.

Dissolved Solids (DS): The organic and/or inorganic dissolved material in solution, such as black liquors, white water, and other process liquids and liquid wastes. They can be determined by evaporating a filter sample to dryness and calculating the weight of the residual in mg/l or g/l.

Dissolving Pulp: A very pure bleached, chemical pulp or cotton linter pulp with a high alpha-cellulose content. It is made specifically for dissolving in suitable solvents for regeneration to form cellophane, rayon, etc, or combining with other chemicals to produce such derivatives as acetates, nitrates, etc.

Dissolving Tank: A storage tank into which the molten chemicals, called smelt, from a recovery furnace drop and are mixed with water or weak liquor to form green liquor.

Distributed Control: An advanced series of functional or geographically located, millwide control devices dedicated to perform sequential and process control for a specific area of operation. It communicates over long distances to interconnected, centralised stations.

Doctor: A thin plate or scraper of wood, metal, or other hard substance placed along the entire length of a roll or cylinder to keep it free from adhering film, fluff, etc, and thus maintain a smooth clean surface.

Doctor Blade: See Doctor.

Display Carton: A carton used for displaying its contents.

Doctor Board: A board used on vacuum-type filters (deckers) to deflect pulp from the point of discharge to a receiving hopper or directly into a chest.

Doctor Broke: Paper that accumulates on the press doctors through breaks in the web.

Doctor Dust: Dust that accumulates on drier and calender doctors. From the doctors it may be attracted to the paper and be pressed into it, causing trouble during printing operations.

Doctor Marks: Redges made by doctors on press rolls which in turn mark the paper.

Document Parchment: (a) A paper made to resemble animal parchment and used for diplomas, commissions, and treaties where animal parchment was formerly used. It is made from high-quality linen hemp and cotton fibres on a fourdrinier machine; it may or may not be engine sized with rosin but is surface sized with the highest quality animal glue or with a special tub sizing. The paper should possess excellent durability and permanence. (b) A vegetable parchment paper used for diplomas and documents.

Dog Hairs: Protruding fibres on the surface, usually of coated paper. Dog hairs are generally longer than fuzz (q.v.).

Dominant Wavelength: A colorimetric quantity used to designate hue. It is the wavelength of the spectrum colour which must be added, to (or subtracted from) the illuminant to make the illuminant's hue match that of the specimen when viewed under the same illuminant. Dominant wavelength is one of the three quantities used in the C.I.E. specification of colour.

Double Calendered: Paper which has been run through the supercalenders twice, generally coated paper.

Double Coated: (a) A term applied to a paper or board which has been coated twice on the same side with the same or different materials. The term is also used (incorrectly) to designate a paper or board coated on both sides. (b) A term applied to a paper or board with a heavy coating (but not necessarily two coatings).

Double Decomposition: A chemical reaction in which the metal of a salt changes places with the hydrogen of water, with both substances salt and water being decomposed. It may be represented by a typical reaction $A^+B^- + C^+D^- = A^+D^- + B^-C^+$. In sulphate cooking the reaction $Na_2S + H_2O = (Na_2S + HOH) = NaOH + NaHS$ is one such example.

Double Deflectors: Type of supports used on higher speed paper machines at both ingoing and outgoing nip of the table roll to prevent back flushing of the back water falling on the table roll to the bottom side of the wire. It is commonly used to newsprint-type paper machines.

Double Dilution: A method of decreasing the consistency of a high density pulp slurry to a desired consistency by the addition of water in two steps, usually by the use of a consistency controller.

Double Disk Refiner: A type of machine used to mechanically treat fibrous materials (chips and pulp), essentially consisting of two metallic surface-patterned disks with one stationary or both rotating in opposite directions on horizontal shafts. Chips or pulp are fed into the centre of one of the disks and moves outward between the surfaces as they are subjected to mechanical treatment.

Double Felted Press: A type of press on a machine handling two separate felts, one contacting the top surface of the sheet and the other contacting the wire side or the bottom surface of the sheet.

Double Sizing: A method of tub sizing, in which the paper is sized in the usual manner, then dried by passing over paper-machine driers, after which the sizing operation is repeated.

Downcomers: The large diameter pipelines in a power or recovery boiler that carry water down and out of the drum to distribution headers at the bottom of the boiler to feed the steam-generating tubes.

Downflow Digester: A continuous digester in which the chips are fed from the top and travel downward as they are being cooked, and discharged from the bottom.

Downflow Tower: A retention tower, usually in a multistage bleaching operation, in which the pulp slurry enters in the top and discharges from the bottom.

Downpass: A chamber or gas passage placed between two combustion chambers in a furnace to carry the products of combustion downward.

Downtime: The amount of time a piece of equipment or process is out of service or not operating due to malfunction, breakdown, repair, or maintenance.

Draft: The differential pressure which caused the movement of air, gases, and other vapours through furnaces, kilns, ducts, and up the chimneys and flues.

Drag: The phenomenon of 'Pulling' created on the fibre suspension being ejected on the paper machine wire form the headbox. It is caused by the wire speed being greater than the slice jet velocity of the stock.

Drag Spots: Irregular thin streaks or lumps caused by agglomerations of stock adhering to the slice. Such an agglomeration reduces the flow of stock at that point, causing a thin streak and when it breaks loose, causes a lump.

Drain: (a) The removal of water from a pulp slurry like that of pulp by allowing it to drop away through a screen by the force of gravity. (b) A ditch or sewer for spillover and liquid waste removal.

Drainability: The ease with which stock (*see* Stock) when drained under gravity, parts with the water of suspension.

Drainage Aids: Substances added to pulp stock slurry to increase its capability to lose water by gravity when on a screen of paper machine wire.

Drainage Factor: The ratio of the amount of time required for water to drain from a quantity of stock slurry to the weight of stock under specified conditions, and expressed as seconds per gram of pulp.

Drainage Time: The number of seconds required for charge of stock to form a mat in a laboratory sheet-making machine, under standard conditions. It gives a measure of the drainage rate or the stock.

Drainer: Storage cells where wet washed and bleached rag pulp are placed for a number of days so that water will drain from it.

Draining Downward: The draining away of the adhesive from a layer of coating into the base sheet of a coated paper during the drying process.

Draw: (a) The intersection tension applied to a paper sheet on the machine to maintain the proper run of the paper between the press and dryer sections operated at different speeds while it is drying. Applied to prevent breakage of the paper sheet. (b) The displacement of

the cut sheet by the thickness of the trimming knife, during trimming of paper.

Draw Down Tanks: Cooking liquor storage tanks located above the pulp mill batch digesters into which white and black liquors are pumped, and from which they are 'drawn' or dropped batch-wise in prescribed quantity into the digester. Also called measuring tanks.

Draw Speed Control: The control of the speed of various groups of dryers of a paper machine so that each section runs slightly faster than the previous one to maintain proper sheet tension between sections. It is accomplished while the sheet goes through dimensional changes during drying.

Drawing Board: A paperboard used for crayon or water-colour drawings. It is made of wood pulp and reclaimed paper stock of sufficient thickness to withstand bending. The board is sized, has a good texture, and is finished without gloss.

Drawing Paper: Strong and close textured paper of varied quality and surface used for pen pencil drawings. It is hard sized and has good erasability.

Dregs: Solids which settle and comprise the underflow from clarifiers in the causticizing process particularly from green liquor clarifiers.

Dressing: (a) The act of applying a sharpening tool to the face of a pulp-wood grindstone so that the teeth will be impressed into the grinding surface, forming a pattern on or sharpening it. Also called burring or jiggling. (b) The finishing operation of paper/board sheets where the reams are held vertically and hogged against table from the four sides to align all sheets neatly.

Dried in Strain : The portion of the potential strain that is retained in paper because of tension of the restraint of shrinkage during drying. The magnitude of the dried-in-strain decreases with time; this decrease is accelerated by exposure to high humidity or by wetting. Other terms sometimes used in reference to this property are dried-in-stress, built-in-strain or stress and frozen-in-strain or stress.

Drier Hood: A covering or a canopy over the whole or part of the drier section of the paper machine or coating unit which serves to collect the hot moisture-laden air from the drying process and exhaust it through suitable fans and duct work. It is designed to control air flow for uniform and rapid drying.

Driers: A series of several steam-heated metal cylinders arranged in two or more tiers in the drier section of the paper machine for drying paper web during its manufacturing.

Drift: The undesirable slow movement in equipment operation over a period of time, below what is considered normal.

Drinking Straw Paper: A paper made from strong, bleached chemical pulp which is used for the

manufacture of spirally wound tubes for drinking purposes. The tube is paraffined in the conversion process and simulates a hollow stem or stalk. Essential properties are strength (particularly tensile strength), stiffness, freedom from dirt, specks, add uniformity of caliper; the finish, sizing, density, and requirements vary with the conversion process.

Drip Ash: Ash in a coal fired furnace which is caused by firing coal with a high fusion temperature. *See* Dry Bottom.

Drip Pump: A pump that collects condensate from heat exchangers and returns it to the system, usually through a deaerator.

Drive: Any equipment, electric motor, steam turbines, belts, chains, gears, etc. that are connected to a piece of machinery in order to make it operate.

Drop Marks: Marks in or on paper caused by water dropping onto it while on the fourdrinier wire.

Drop-off: (a) A dropping off of the couched sheet from the underside of the bottom felt on a cylinder machine. (b) A small side sheet made when the order does not fill the machine trim.

Droplet: A vertical run of pipe, attached to the side of vacuum washers, which develops suction inside the washer drum due to the wash water falling down through this pipe by the force of gravity. The water normally falls into a seal box or tank.

Drubber: A special defibring machine used for reducing chips into their fibre components without cutting the fibres or grinding up the foreign matter. It consists of a horizontal shaft carrying metallic impellers spaced along it and having small vanes to each face at the periphery all located in a metal casing.

Drum: (a) Horizontal, cylindrical pressure vessel, located at the top of the boiler, which receives a steam water mixture from the evaporating sections of the boiler and is the point of introduction of feedwater. It serves in the storage of water, separation of steam and water from the evaporator, and feedwater heating. (b) The wire-covered cylinder that is located in the vat of a vacuum pulp washer onto which the pulp pad is formed.

Drum Filters: Pulp washing and stock slurry dewatering types of process units using one wire screen-covered, cylindrical drum, partially impersed in pulp suspension and white water, from which it picks up fibre and forms a sheet as a means of separating the solids from the liquids. It is commonly used in multi-stage downstock washing and pulp bleaching processes.

Drum Save-all: A white water fibre and filler reclamation unit located in a paper mill. It consists of a wire-covered drum partially submerged in a vat with sweetener stock and white water, with internally

applied vacuum so that a recoverable mat forms on its surface and removed for reuse, whereas the filtrate is used in suitable process stages.

Dry Bottom: Ash removed from furnaces in solid or 'drip' state. It is caused by firing coal with a high ash fusion temperature.

Dry Content: Relation between the mass remaining after drying by a standard method and the mass at the time of sampling, expressed as a percentage.

Dry Cook: A bad wastepaper cook in which the ink is not acted upon and the sizing is not thoroughly saponified, making it impossible to remove these during subsequent washing operations. Also commonly called a 'bad bleach' in a deinking mill.

Dry End: The mill term for drying section of the paper machine, consisting mainly of the driers, calenders, reels and slitters.

Dry Felt: An absorbent sheet of felted fibres of vegetable or animal origin, or mixture thereof, suitable for use in the manufacture of bituminous saturated felt, roll roofing, siding, shingles, etc. This material is also designated as organic or rag felt.

Dry Finish: (a) A process in which paper or paper board is calendered without the application of surface moisture. (b) A descriptive term applied to paper, particularly wrapping paper, and paperboard processed in this manner and characterized by having an unglazed fairly rough surface. Dry-finished boards have a relatively low density and are normally used in the manufacture of setup cartons.

Dry Lake: Ground, artificial pigment which was made by depositing a dye on a mineral base, such as clay and drying it. It is used to make up colour pastes and colour paper.

Dry Limestone Process: Removal of oxides of sulphur from gaseous mill effluents by passing them through crushed limestone.

Dry Printings: Any paper which dries rapidly after printing. Any paper making materials may be used. It is essential, however, to have a surface and ink receptivity such as to ensure rapid drying of quick-drying ink.

Dry Pulp: Cut sheets of pulp that are formed and dried on a paper machine or any mass of pulp air dried.

Dry Rub Resistance: The resistance of the dry surface of coated or uncoated paper or paperboard to disruption of the surface when subjected to rubbing or scuffing.

Dry Size: A water-soluble completely saponified type of rosin size, prepared by spray drying or drum drying, that can be added directly to pulp stocks or pre-dissolved to improve and control distribution in the stock.

Dry Steam: Steam that contains no moisture and may be either saturated or superheated.

Dry-waxed Paper: Paper which has been passed between rolls, one of which revolves in a bath of molten paraffin or other wax and subsequently through squeeze rolls, so that the major portion of the wax is driven, into the interior of the sheet and the paper feels 'dry'. The wax may also be applied by means of transfer rolls.

Dryer Deflector: Special air doctors located at critical points along paper machine dryer felts to reduce undesirable air flows induced by the movement of the fabric blanket.

Dryer Felt: A continuous belt made of cotton synthetic or asbestos fibre, and used in the dryer section of a paper machine to press and maintain positive content of the sheet against the surface of the dryer cylinder. Also spelled drier felt.

Dryer Section: A grouping of a number of gear-driven, cylindrical metal drums in series, which are steam-heated to dry wet paper passed over it. The dry end of a paper machine may contain several of these sections.

Drying Cracks: A cracking of the surface of a coating due of excessively high rates of evaporation of the moisture in the coating.

Dual Press: Suction press section of a paper machine, usually consisting of three rolls set horizontally to each other. The first roll is a rubber-covered suction press, the second a hard-surface roll, and the third a rubber covered roll.

Ductility: The degree to which foil or sheet can be drawn or elongated without rupture.

Dull Finish: A finish with a low gloss. With respect to coated box paper, a finish with a glare test less than 55 percent.

Dull Glazed Art Paper: A type of dull-coated printing paper designed for art reproductions and other high quality printing jobs.

Dummy: A set of blank sheets made up to show in advance the size, shape, form, and general style and plan of a contemplated piece of printing such as a book, etc.

Dumpers: Hydraulically operated elevating platforms on which chip trucks, trailers, and freight cars are tilted to unload them into a receiving hopper, feeding onto a conveyor belt.

Dunnage: Cargo-protecting and storing materials used in transportation, including various types of braces, props, and heavy polyethylene-coated inflated kraft paper bags.

Duotone Finish: A coloured paper surface effect, a result of using uneven pressure during finishing. It causes variations in brightness or depth of colour.

Duplex Board: A general term for a board made of two different stocks or colours on a cylinder machine, or a combination cylinder-fourdrinier machine, or a fourdrinier machine equipped to receive two different pulp furnishes. It is a combination board limited to two stocks of colours.

Duplex Coated Bristol: A solid-centre bristol base, coated with a bright or deep colour on one side and with a tint or white on the reverse side. The bristol base is usually made of softwood and hardwood chemical pulps, approximately of 275 g/m² grammage. It is used for advertising postcards, folders, covers, and other forms of direct mail publicity.

Duplex Coater: A machine which coats the two sides of a web of paper simultaneously.

Duplex Finish: A finish that is different on the two sides.

Duplex Foil Backing: An M.G. paper made of bleached chemical pulp. It has a high, smooth finish on the wire side and an antique finish on the felt side. The paper is soft, has good tensile strength and good formation. Wet strength and/or dyeing may be required to resist water-based adhesives.

Duplex M.F. Litho: A paper used for lithography, one side of which has a rough surface and the other a smooth machine finish. This differs from M.G. litho in that it is dried without the use of a Yankee drier.

Duplex Mill Wrappers: Heavy, water-finished wrapping papers duplex as to colour. They are used for the protection of rolls or bundles of paper, textiles, etc.

Duplex Offset Blotting Paper: A combined blotting paper made by pasting a sheet of white offset paper with one of blotting (which may be variously coloured). The offset paper side is largely used colour printing. This blotting is normally made in grammage say 310 g/m² to 430 g/m².

Duplex Paper: Any paper showing different colours, textures, or finishes on the two sides of the sheet.

Duplex Photographic Film Paper: A paper usually made from chemical pulp on a combination fourdrinier-cylinder machine. It has a high tensile strength and is free from material which would affect the photographic film. One side is black and the other side is generally white or coloured.

Duplex Super: Any supercalendered paper which has a higher finish on one side than on the other. It is made by running the paper through the supercalender so that one side does not come into contact with chilled cast-iron rolls. Friction-glazed coated papers are duplex super.

Duplex Texture: Texture produced by laminating two papers or boards with different textures, by lining a board with two kinds of stock, or by using two different stocks on a cylinder or cylinder-fourdrinier machine.

Duplicating Note Paper: Tablet or writing paper converted into a form in which part of all of the sheets are carbonised so that writing may be duplicated by inserting blank sheets.

Duplicating or Duplicator Paper: Absorbent or semi-absorbent paper with a matt finish used for making copies from a stencil duplicating machine.

Duplicating Stencil: Paper of a special structure impregnated or coated or both with a suitable preparation for the reproduction by means of suitable equipment, the text matter or patterns which have been impressed on it in such a manner as to permit the passage of an appropriate ink. The impression is generally obtained by means of the type of typewriter or by hand with a special stylus or by a photochemical process.

Duplicator: A machine or device, largely for office use, that reproduce graphic materials by spirit, stencil, lithographic, or other process. Many modern duplicators are small litho-graphic presses.

Durability: The degree to which paper retains its original qualities under continual usage. This is not to be confused with permanence which may result from impurities in the paper itself or agents from the surrounding air.

Dust: Any fine grain, particulate matter that is capable of being suspended in air, or very fine, loose material located on the sheet surface.

Duster: A machine used in a rag pulp mill consisting of a rotating, perforated, cylindrical drum in which old rags and papers are rumpled to remove dust and other undesirable foreign materials. Sometimes called rag duster.

Dusting: (a) The undesirable separation and collection of minute quantities of surface coating materials, additives, fillers, and fibres, from the sheet in the finishing operation, or during its use in printing and conversion into user items. (b) A test made on pigment coated paper and paperboard to determine the quality. Also called Dry Rub.

Dusting Paper: A soft, absorbent, nonabrasive sheet made from chemical pulps in a wide range of grammage which is treated with a furniture polishing oil and used for dusting or polishing purposes.

Dye: (a) A natural or synthetic, organic or inorganic substance used to make up materials to impart a colour to pulp slurries or the paper or paperboard sheet in papermaking, or to make up coating material to colour their surfaces. The name is used interchangeably with common paper mill term, dyestuff. (b) The act of colouring (or changing the colour of) any material (stock, paper, etc) by bringing it into contact with another material (dye) of a different colour in such a

manner that the resulting colour will be more or less permanent.

Dyeing: *See* Beater Dying.

Dyeline Paper: A type of light sensitized paper used in drawing office on which the drawing is produced in colour on a white or lighter coloured background.

Dyestuffs: These are acid dyes, basic dyes, colour lake. Direct dyes pigments used for dying paper and paper products.

Dynamite Sheet Paper: A well-formed smooth, high finished sulphite or kraft sheet, to be converted into tubes for packaging of dynamite powder, etc. Tensile and tearing strength and moisture resistance as well as finish and uniformity are important characteristics.

Dynamo: An electrical power generator.

Dynamic Bleaching: *See* Displacement Bleaching.

Duplicating Stencil Base Paper: Thin, strong light weight paper (*see* 'Light Weight Paper') made from long-fibred stock (*see* Stock) intended after suitable impregnation or coating for the preparation of a duplication stencil.

Drop Test: A test which consists of releasing a loaded container or package from a known height on to a concrete floor or flat metal plate and studying the effect on the package and the contents.

E

Early Wood: *See* Spring Wood.

Easy Beating Pulp: Pulp that reaches its maximum bursting strength in a short time during the beating process, and shows only a slight drop in tear and burst after it reaches its maximum.

Easy Bleached Pulp: Pulp that has not been completely bleached.

Easy Bleaching Pulp: A term applied to a thoroughly cooked pulp, usually of lighter colour than regular unbleached pulp, which can be bleached with a minimum of bleaching agent.

Economiser: A heat exchanger used to preheat boiler feed water by recovering heat from the flue gas. It is usually a continuous tube design and is generally located in the flue gas flow between the superheater and air heater.

Edge Cutters: A device comprising two jets of water which are adjustable across the machine and which divide the wet web on the wire lengthwise so that the edges may be removed generally before the couch. In this way they control the width of the web going forward from the wire part and leave it with a comparatively clean edge.

Edge Tearing Resistance: The resistance by paper to the onset of tearing at the edge of a sheet. This test

measures the force required to initiate and to continue a tear in paper and paper board.

Effect: One unit of a multiple vessel-type evaporator.

Effective Alkali: The $\text{NaOH} + 1/2 \text{Na}_2\text{S}$ content in sulphate cooking liquors. It is expressed as Na_2O , which is an indication of the actual amount of alkali available for or remaining during sulphate pulping reactions.

Effective Heat: The heat that is supplied to a pulp and paper mill building which is dependent on the difference between the temperature of the entering air to be heated and the air already inside the building.

Effectivity: A term sometimes used in relation to alkaline pulping cooking liquor. It refers to a percentage value determined by dividing the effective alkali by the total alkali with both expressed as Na_2O grams per litre, multiplied by 100.

Efficiency: The amount of useful work done in relation to the potential capacity of the complete process or any piece of machinery or equipment in the mill.

Effluent: A discharge of pollutants into the environment, partially or completely treated or in its natural state. Generally used in regard to discharges into sea, river or lake or even-ground which could be polluting.

Efflux Ratio: The headbox slice jet velocity, divided by the wire speed on the wet-end section of a paper machine. Also referred to as rush/drag ratio and push/drag ratio.

Eggshell Book Paper: A book paper having an Eggshell finish (q.v.).

Ejector Pulp: Types of pumps that have no moving parts and depend on the movement of a motive fluid in the form of a liquid, gas or vapour, flowing through the pump at a high velocity, thereby imparting a motion to the other fluid to be moved.

Elastic Modulus: The ratio of stress (nominal) to corresponding strain below the proportional limit of a material. It is expressed in force per unit area based on the average initial cross sectional area. Also known as Young's Modulus.

Elasticity: That property of a material which enables it to undergo deformation and to recover its original dimensions after removal of the deforming stress. Elasticity is determined more by ability to recover initial shape than by capacity to be deformed or extended. It should not be confused with Extensibility or stretch (q.v.).

Elbow: A pipe fitting which is used to change the direction of a pipe in varying degrees.

Electric Board: A dense, hard paperboard used in the electrical industry for insulation on switch blocks or other electrical equipment.

Electrical Conductivity: The ability of a substance (specifically a sheet) to pass electric currents through it. The term is generally used in reference to treated electrical papers used in condensers and insulation having very low conductive properties.

Electrical Insulating Paper or Board: Paper or board having certain properties, namely, high electrical strength, durability, absence of conductive metallic particles and uniformity in thickness and formation. Such material is being used by the electrical industry for insulation.

Electrical Insulation Fibre: A tough flexible grade of Vulcanized fibre (q.v.) having high dielectric, tensile, and bending strength. It is primarily intended for electrical insulation applications and others involving difficult being or formation operations. It is made in thickness from 0.100 mm to 3.175 mm (0.044 to 0.125 inch) in colours ranging from gray to a bluish gray.

Electrodialysis: A process that uses electrical current and an arrangement of permeable membranes to separate soluble minerals from water or effluents.

Electrolytic Paper: An asbestos paper which is used as a diaphragm in certain electrolytic processes.

Electromagnetic Flowmeter: A flow sensing device commonly used to measure pulp slurry flow. It operates on the principle that a conductive fluid moving through a magnetic field will generate an electromotive force (voltage) which is proportional to its velocity, and which can be detected by a pair of electrodes in a pipe line. This voltage signal can be converted to the rate of flow measurement.

Electrostatic Copy Base Stock: A bond or writing paper designed for coating with zinc oxide formulations to produce copy papers used in Electrofax type office reproduction machine.

Electrostatic Copy Paper: (a) A bond paper used for making copies by the xerographic process. (b) A zinc oxide coated paper used for making copier by the electrofax process.

Electrostatic Precipitator: An air pollution control device that removes particular matter by imparting an electrical charge to particles in a gas stream for mechanical collection on an electrode.

Element: A component of a process, a piece of process equipment or a device.

Elevating Truck: Types of vehicles used in paper mills to pile up rolls, bales of paper and other material.

Elutriation: (a) A process of sludge conditioning in which certain constituents are removed by successive flushing with fresh water or plant effluent, thereby reducing the demand for conditioning chemicals. (b) The operation of feeding water under pressure into the bottom cone of a centricleaner tube to enable lighter

fibrous rejects to rise upwards and thereby reduce rejection.

Embossed Blotting: Any blotting paper which has been treated after manufacture in an embosser or plater in order to impress on the surface, either on one or both sides, a figured design.

Embossed Cover Paper: Any cover paper with an embossed surface created by passing the sheet through a pair of matched patterned steel rolls or through a combination of a pattern roll and a smooth backing roll.

Embossed Paper: Having a raised or depressed design formed (a) by passing the paper between an engraved steel rolls or plate and another roll or plate of soft or compressible material, such as paper or cotton, or (b) by pressing between strong, coarse fabrics, or (c) by passing between etched male and female iron or steel rolls. The operation is used for decorative effects and is generally applied to book, blotting, cover, and wallpapers.

Emery: A kind of abrasive (pulverized corundum) used in a surface-coating mixture with an adhesive in the manufacture of abrasive paper.

Emery Paper: An abrasive paper (q.v.) the base stock of which is a kraft sheet coated with emery powder with a glue or resin bond, which is used in sheets and in narrow rolls for polishing operations on metals.

Emission Factor: The average amount of a pollutant emitted from each type of polluting source in relation to a specific amount of material processed.

Emission Standard: The maximum amount of a pollutant legally permitted to be discharged from a single source, either mobile or stationary.

Emissivity: The radiant energy emitted by the surface of a material at a given temperature, divided by the radiant energy emitted by a standard material (blackbody) at the same temperature.

Emulsified Fuel: An emulsified mixture of fuel oil and water.

Emulsifier: A surface-active agent for promoting the formation and stabilization of an emulsion. Same as emulsifying agent and surfactant.

Emulsion: A liquid or solid dispersed in an immiscible liquid in droplets larger than colloidal size, such as water in fuel oil and wax in paper-coating materials.

Emulsion Coated Paper: Paper coated with plastics or resins applied in form of an emulsion.

Enamel Board: It is one side coated of one or more plies (*see* 'Ply') which may or may not be combined by pasting (*see* 'Pasting'). The important charac-

teristics are gloss, high stiffness, non-cracking, smooth surface of coated side and excellent colour reproduction or multi-colour printing.

Enamelled: A common general reference to any paper and paperboard whose surface has been treated with a coating mixture to impart high surface finish.

Enamelled Postcard: A postcard board single-or double coated on one or both sides, used for souvenir postal cards and similar work where a high finish is desired. It is often linen finished on one side or on both sides.

End Bands: Heavy paper used to protect the ends of paper rolls for shipment.

End Dump Freight Car: Freight cars designed for transporting and unloading chips with an end door opening hinged at the top which swings open to discharge chips when tilted on a hydraulically operated elevating platform.

End-Leaf Paper: A white, coloured or ornamental paper used for binding a book's contents to its cover. It is usually made of chemical pulp and is characterized by high tearing and folding strength, and ability to paste smoothly to the book cover. It is also referred to as end leaves, end sheets, end paper, and fancy end.

End Thrust: The tendency of a pump impeller to move towards, and sometimes rub against, the casing due to the pressure across it.

Energy: The capacity to do work.

Engine Sized: Paper sized at the pulp stage before being formed into a sheet.

Enrichment: The discharge of nitrogen, phosphorous, carbon compounds or other nutrient contaminants into mill waste receiving waters that generally increase the growth potential for algae and other aquatic plants.

Entertainment: The entrapment and carrying over of material in stream. It is sometimes undesirable, such as air in black liquor or stock slurries causing foam and droplets of cooking liquor and fibre in the relief gases of a sulphate digester.

Enthalpy: The total amount of energy contained in a unit mass of a substance due to its condition or state. It represents the sum of the intrinsic energy plus the pressure-specific volume of the product.

Entrained Air: Air that is either dissolved or suspended in a liquid or slurry, such as pulp stock, and is commonly caused by vortexing in pumps or other mixing action.

Entrainment Separators: Components of a black liquor multiple-effect evaporator which removes entrained liquor from the vapour. They consist of a centrifugal-type catch all mounted inside or outside

the vapour head on each effect, as well as in the upper portion of the heating element.

Entropy: The property which describes (Mathematically) the portion of the heat added to a process which cannot be converted into useful work; it is a measure of unavailable heat. The most theoretically efficient process is the one carried out at constant entropy, or isentropically.

Envelope Manila: A fourdrinier M.F. paper made in manila colour of chemical pulps, sometimes with some percentage of mechanical wood pulp.

Envelope Paper: A general term for papers used in the manufacture of envelopes. Because of the wide variations in use requirements, envelope papers vary in grammage, appearance and finish to such an extent that many kinds of paper may be employed.

Envelope Folding: See 'End Folding'.

Envelope Paper, Kraft: A fourdrinier M.F. or M.G. paper made of unbleached, semibleached or full bleached sulphate pulp, used in the manufacture of envelopes when strength is a primary requirement. Other desirable properties include smooth fold, strength at crease, good printability, and lack of tendency to curl or cockle.

Envelopes: Converted paper products designed for wrapping or enclosing material to be stored or mailed. Envelopes are made in many forms from many different grades of paper and some typical items are: Bank by Mail, Commercial, Outlook, Window, Airmail, Self-seal, Postage Saver, Booklet, Clasp or Snap, Photo Mailer, Two compartment, Coin, Open End, Open side. See 'Correspondence Envelope'.

Environmental Impact Statement: A document prepared by a Government Agency on the environmental impact of its proposals for legislation and other major actions significantly affecting the quality of the human environment. Environmental impact statements are used as tools for decision making and are required by the National Environmental Policy Act.

Environmental Pollution Abatement: The act or process of minimizing or eliminating the effects on the environment of municipal or industrial air, water and land pollutants.

Enzyme: A micro organism that activates or accelerates biological processes and is used in liquid, powdered, pellet, or capsule form in a paper mill. For example enzymes are used to convert starch so that it can be used in the sizing of paper.

Epilimnion: The upper layer in a body of water, being warmer and less dense than the lower water.

Equilibrium Relative Humidity: The ambient relative humidity, at a given temperature, at which

exposure of paper will not result in moisture absorption or desorption.

Equivalent Steam: A common powerhouse term for latent heat of evaporation which is the heat, in Btu (970.4) or K Cal (539.2) required to convert one kg of water at 100°C and atmospheric pressure into saturated steam at the same pressure and temperature.

Erasability: That property of a sheet which is concerned with the ease of removing typed or written characters and impressions or both from the sheet by mechanical erasure, and the cleanliness or the amount of abrading on the erased portion, and the suitability of the erased portion for reuse.

Ester Number: The difference between the saponification number and the acid number in the laboratory analysis of rosin size used in paper-making.

Eucalyptus: A large genus of short-fibred broad leaved wood species, originally found in Australia but cultivated in many parts of the world. Eucalyptus wood is used as a raw material for the manufacture of paper and rayon grade pulp.

Evaporation Factor or Efficiency: The ratio between the quantity of water evaporated to the quantity of steam used and expressed by a number.

Evaporation Load: The evaporation capacity required to dry paper based on tonnage per day or buy operating conditions such as speed and width. It is used to determine the number of dryers needed and exhaust requirements.

Evaporation Pond: Shallow, artificial ponds where mill effluents are pumped or allowed to flow and permitted to dry and either removed or buried by more effluent.

Evaporative Cooler: A bare evaporator coil through which cool air passes and over which water is sprayed to accomplish heat transfer in the water through evaporation.

Evaporator Capacity: The quantity of water an evaporator is capable of removing from a liquor solution. It is directly proportional to the difference in temperature between the steam and the liquor in each effect.

Evaporators: Process equipment in which various liquids, such as spent liquors from the pulp washing process, are concentrated by the removal of water so that chemicals may be readily recovered from it. There are several types of evaporators like long-tube evaporators, falling film evaporators, cyclone evaporators, cascade evaporator. Evaporators, may be operated either at atmospheric pressure or in vacuum.

Evener Roll: A perforated roll located just prior to the slice in a paper machine headbox. It is used to stabilise the flow.

Evenside: Paper with two top sides and identical on both sides of the sheet; used in the case of litho and offset colour work for perfect printing on both sides of paper which is not possible on the underside or wire-side or ordinary paper. It is made on a twin wire machine in which two wet webs manufactured simultaneously are pressed together underside to underside, leaving the two topsides outermost.

Evensided Paper: A paper with closely similar characteristics on both surfaces usually made by pressing two wet webs of lighter paper with both felt sides outside. It is also known as 'Twin Wire Paper'.

Evergreen: See Deciduous.

Excelsion Tissue: Strips of paper made by passing light-weight papers through a shredder. It is used to pack delicate materials for handing and transporting.

Excelsior Wrapping: A medium-weight sheet made from chemical pulp. It is used as a covering for straw and shredded wood or paper to make up protective pads used in the shipment of breakable materials.

Excess Air: The weight of air introduced to power and recovery furnaces in excess of the theoretical requirement, calculated by subtracting the theoretical necessity from the total air. It is usually expressed as 'percent excess air', determined by multiplying the weight of excess air by 100, and dividing by the weight of the theoretical air.

Excess Shrinkage: Cross-direction shrinkage of the web between successive impressions in printing, sufficient to cause misregister.

Exercise Book Paper: Flat writings, usually ruled, for use with pen or pencil.

Exhaust Steam: Steam that has completed work. Also referred to as dead steam.

Exhauster: (a) A fan on a coal pulverizing outlet used on someboilers to air-convey fuel from the pulverizer to the burners. (b) A type of pump used to produce a vacuum for use on paper machine drainage and dewatering system. It is made with a series of impellers rotating at a high rate of speed (typically 3 600 rpm).

Expansion: A change in the dimensions of a sheet of paper or board caused by atmospheric changes in humidity and temperature.

Exploded Fibres: Wood fibres prepared by subjecting chips to a high-pressure steam treatment for a few seconds, followed by a quick release of the pressure, thus causing the fibres to separate or 'explode'. These are used in the manufacture of various types of boards.

Express Paper: A term sometimes used to designate a heavyweight paper having an extremely high actual density (approaching a specific gravity of unit) and made to caliper specifications. It is used in the production of sheet plastics, the paper being impregnated and laminated under pressure.

Extended Nip: A type of press nip design in which a bottom shoe, conforming to the shape of a top roll, presses a rubber belt riding on it and a pair of felts with the sheet of paper between them, against the rotating top roll. By properly loading the shoe, the nip can be extended from the usual 2.54 to 4 cm (1 to 1½ inches) to about 20 to 25 cm (8 to 10 inches). Thus increasing the residence time of the sheet in the nip.

Extensibility: The capacity for extension (extension being the increase in length per unit length). Rubber affords a good example of great extensibility.

Extensible Paper: A smooth-appearing stretchable paper with high energy absorption properties. A controlled amount of stretch to meet specifications may be imparted in a number of ways, either on or off the paper machine by methods generally differing from those used to produce creped papers. Extensible papers, made in variety of grammage and grades, are used for multiwall sacks, packaging, converting, laminating, wrapping, etc. Clupak Inc. USA offer a patented process to manufacture extensible paper for packaging-known as Clupaking.

Extrá High Bulk Book Paper: A book paper which under 250 kPa of pressure bulks 330 pages or at least 25 more for a grammage of 65 g/m². Other weights are in proportion.

Extraction: (a) Steam extracted from intermediate stages of a turbine as a heat source for process or feedwater heating. (b) Cooking liquor removed from a continuous digester which is sent to the chemical recovery cycle. (c) A stage during the bleaching process in which the solubilized lignin and hemicellulose are removed from the cooked material.

Extraction Stage: That stage in a multi-stage pulp bleaching operation ('E' stage) usually following the chlorination stage, in which sodium hydroxide (NaOH) is used to remove water insoluble chlorinated lignin and other coloured components not removed in an intermediate washing operation. Also referred to as the caustic stage or alkakine extraction stage.

Extractor: A piece of process equipment used primarily to thicken recycled chemical fibre stock slurries prior to high consistency bleaching. The thickening is accomplished by removing water when the slurry is passed through a perforated cylindrical screen.

Extruder: Equipment to manufacture tubes, rods, filaments, films and shapes of various profiles on a continuous basis; usually (but not necessarily) associated with plastics.

Extrusion Coated Paper: A method of coating a continuous web of paper or board with resins, plastics or similar compounds. The coating is applied through an extruder die positioned immediately above the nip between a supporting roll and a chill roll.

End Folding: A method in which the wrapping is neatly folded over the ends of the article being wrapped. It is also called 'Envelope folding'.

End Sealing: The process of treating the inside of the open end of a tube with a band of a suitable medium to give a hermetically tight seal when the tube is folded.

F

Fabric: A material fabricated of any fibre; usually a planar structure composed of interlacing yarns, fibres or filaments and produced by weaving, knitting, felting, or other means.

Fabric Forming: The process of forming a paper web on the wet end of a paper machine equipped with plastic fabric 'Wires'.

Fabric Press: A type of paper machine wet press that uses a special multiple weave fabric belt sandwiched between the regular felt and the rubber covered roll, increasing the capacity to receive and remove water from the nip between the rolls.

Fabric Purge: Water that is squeezed from the sheet of paper and felt into the voids of a fabric on a fabric-type wet press. It is removed from the fabric by the suction action of the fabric leaving the fabric roll of the press. This is accomplished by centrifugal action of the fabric wrapping a fabric-carrying roll and by passing the fabric over a slotted suction box.

Fabric Shrink Sleeve Press: A type of paper machine wet press in which a special multiple weaving fabric is shrunk over the rubber-covered roll to increase the capacity to remove water from the nip between the rolls.

Fabric Shrink Sleeve Purge: Water squeezed from the sheet and felt into the voids of the fabric of a fabric shrink sleeve press and removed from the fabric voids by means of an air shower consisting of jet of compressed air.

Facial Tissue: (a) A name given to a class of soft absorbent papers in the sanitary tissue group. Originally used for removal of creams, oils, etc, from the skin, it is now used in large volume for packaged facial tissue, toilet paper, paper napkins, professional towels, industrial wipes, and for hospital items. It is made of bleached mechanical chemical pulp, on a single cylinder or fourdrier Yankee machine, with creping on a Yankee drier at low moisture content, the finished crepe ratio being 10 to 25 percent. Desirable characteristics are softness, strength and freedom from lint. (b) Facial tissue stock in sheets usually packed for resale. Also referred to as Handkerchief Tissue.

Facing: A form of liner used as the flat components of corrugated fibreboard.

Facing Paper: Lightweight paper, such as fancy cover, book, and manila. It is pasted on various thickness of base stock or filler board to produce picture mounts, photomounts, and other boards requiring plain or fancy covering.

Fade: The slow loss of change in colour of paper. It is usually caused by exposure to light over a period of time.

Fading: A gradual change in colour of a paper. It is usually applied to the change produced by exposure to light.

Fail Safe Operation: A characteristic of a piece of mill equipment, such as valves, switches and machinery, which will fail to a safe condition when the actuating energy source is interrupted. The safe condition may be in a closed or shutdown position, fully open or operating condition, or remain in a fixed position.

Fair Pan: A special device used to apply carbonate filler in dilute solution directly on the surface of the wet web of paper on the wire.

Falling Film Evaporator: A type of long tube vertical evaporator sometimes used to concentrate spent liquors from pulp mills by having them flow through steam-surrounded tubes to evaporate the water from the liquor. Some times called a long tube evaporator or vertical film-type evaporator.

Fall Front Box: A box having a position or whole of the front hinged to enable it to fall and thus display the contents.

False Bottom: A partition (often perforated) located just above the actual bottom of a tank or chamber. It is used by the paper industry in storage and process vessels when it is desired to drain liquids from a mixture with the possibility of returning the liquids for recirculation through the mixture.

False Pressure: That pressure built up in a upper part of a batch digester during a cook, which is higher than the equivalent saturated steam pressure and is caused by an accumulation of non-condensable gases which prevents temperature rise to proper cooking temperature if not removed or relieved.

Fan: An apparatus to create air movement and circulation by blowing air in or out of an area.

Fan Duster: A machine used in the preparation of rags to be used in paper making in which the rags are beaten to produce dust. The dust is drawn away by means of the fans.

Fan Pump: A large centrifugal-type pump used to pump and mix pulp stock and large quantities of recirculated dilution water and stock to the headbox of a paper machine.

Farad: A unit of electrical capacity. The capacity of a condenser (capacitor) charged to a potential of 1 volt by 1 coulomb of electricity.

Fast Colour: A colour which is resistant to the action of external agents, such as light, acids, alkalies, etc.

Fastness: That property of a paper or dyestuff which renders it resistant to change in colour. Depending upon its use, a paper or paper board may be required to show good resistance (fastness) to change in colour after exposure to destructive influences such as light, acids, alkalies, bleaching agents, or water usually under specified test conditions.

Fatigue Failure: The failure resulting from a number of repetitions of load (or strain) in contrast to creep, which is the deformation caused by the continuous application of load for an extended period of time.

Feather Edge: (a) A thin, rough edge, like a deckle edge. (b) Papers Made with thickness tapering from that of the body sheet to the edge. Such edges are used on fireworks papers, for example, so that when formed into a tube, the outer edge will paste down smoothly.

Feather Weight Paper: A loosely made bulky paper similar to antique paper.

Feathering: The irregular spread of ink on either side of the line drawn with writing ink over a sheet of paper.

Featherweight: Loosely made floppy book paper similar to ordinary antique wove or laid but much lighter and bulkier.

Featherweight Book Paper: Paper used principally in the manufacture of novels especially where good bulk is required for a given number of sheets. The paper is made with an antique finish.

Feculose: An acetylated starchy product produced by treating starch with glacial acetic acid. Unlike normal starch, it gives a clear solution in hot water and is useful as a sizing in paper.

Feedback Control: A process control scheme in which a measured variable is compared with a desired value to produce a signal used to perform a corrective action that will reduce the magnitude of the difference between them.

Feeder: A device used to supply materials to a process such as pulp or chips to the digester and subsequent bleaching stages. It is also referred to power supply circuit.

Feedforward Control: A process control scheme in which the information concerning one or more conditions that can disturb the controlled variable is used to perform corrective actions to minimize the deviations of the controlled variable from a desired value.

Feedstock: Pulp stock slurries entering a unit process during pulp and paper making operations.

Feedwater: High pressure water supply pumped to a boiler drum of a power or recovery boiler.

Feedwater Heater: A heat exchanger used for heating the boiler feed water by using the extraction steam from turbines.

Feel: The impression obtained by touching and handling paper to judge its finish and general quality.

Felt Air Supply Unit: A part of the paper mill air supply system used on paper machines to help dry the top and bottom felts and provide a source of warm air around the sides of the dryers to pick up moisture driven from the pockets, thereby increasing felt life.

Felt Board: Board containing textile fibres specially processed to give a loose, soft texture.

Felt Cleaning Compounds: Nonionic chemical detergents and chemicals used for pH control that are continuously added to the shower water of the felt cleaning system on a paper machine.

Felt Cleaning Showers: A set of showers dispensing detergent, acid, and/or alkaline agents. These showers are used on paper machine wet presses to clean and maintain felt openness. This procedure is followed by water rinse showers.

Felt Conditioner: A device consisting of one or more conditioning boxes provided with suitable vacuum system, attached to the frame of the paper machine. When passed over the conditioners, the felts are kept clean and open to assure uniform and maximum water removal at the presses.

Felt Dryer: A cylindrical steam-heated dryer in the paper machine dry end that runs in direct contact with the felt and dries any moisture it has picked up.

Felt: A continuous belt generally made of wool or a combination of two or more of the following fibres; wool, cotton, asbestos, and synthetic fibres. Felts perform the function of mechanical conveyors or transmission belts, provide a cushion between the press rolls as a medium for the removal of water from the wet sheet. The degree of fineness of felts is defined, in a general way, by the following terms: cotton warp, pulp, common wet, fine wet, superfine wet, extra superfine wet, fine press, superfine press, plate press, super plate press, light super plate press and pickup. Felts may be divided according to use, as follows: Bottom felt, which contacts the bottom side of the sheet of board or paper, and a top felt contacts the top side of the sheet. Drier felt — a felt used in the drier section of a paper machine for the purpose of pressing the sheet against the drier cylinders. Endless felt—a felt that is woven in the form of a continuous belt; It is preferably called a jointless felt. Pickup Felt — A dense, firm, closely woven felt which picks up a wet sheet from a wire or from other felt. A suction pickup felt has a porous structure used to transfer the sheet from the fourdrinier to the press. The sheet is sucked

from the wire by a vacuum roll and supported by this felt as it is being transferred. A relatively short felt which runs between press rolls. These felts generally provide more cushion than wet felts. A wet felt is also a press felt and it runs between the first set of press rolls. In a sense, all papermakers felts are wet felts. Custom and usage generally designate as wet felts those which run between the first set of press rolls wet felts generally provide for water removal and have less cushion than press felts.

Felt Finish: (a) A finish applied to paper at the wet press by the use of felts of peculiar weave, such as corduroy, instead of plain weaves. (b) A finish produced on a Yankee machine by the felt which holds the paper in contact with the dryer. The felts carry special markings which are pressed into the paper. (c) A finish applied to dry paper by the use of felts and mechanical pressure in a plater.

Felt Guide: A mechanism that senses the position of a felt on a paper machine and automatically adjusts an offset felt guiding roll to compensate for any weaving motion of the felt, thus preventing the felt from running off the machine.

Felt Guide Roll: The adjustable offset roll in a guiding system that compensates for felt weave motion and maintains the felt on the machine.

Felt Hairs: Hairs from the fabric of felts, which appears in the surface of paper.

Felt Mark: (a) A mark or pattern on paper or paperboard produced by the impression of the press felt. (b) A mark or thin spot in paper or paper board caused by a dirty felt or by a spot of grease on the felt.

Felt Marking: A design produced by special patterns woven directly into the felt. The effect lies between that of the embossing or plater method and the dandy roll or stamping-roll method.

Felt Roll Doctor: A doctor blade often provided on the first out-side felt roll after the paper machine wet press nip. It is used to lift off any part of the sheet that may follow the felt when passing the sheet through the press or at the time of a break.

Felt Rolls: Metallic rolls located in each space between paper machine dryers and used to turn the felt and/or carry it back over on its return run.

Felt Run: The arrangement and direction of the felts on the paper machine.

Felt Side: That side of the paper web which has not been in contact with the wire during manufacture. It is the top side of the sheet.

Felt Stretcher: A device on a paper machine used for taking up the slack in the felt and applying the proper tension.

Felt Whipper: Variable-speed, motor-driven, bearing device located on the outside of the wet felt on paper

machines. It is used to forcibly loosen any dirt picked up by the felt, which is then washed off by a strong water shower.

Felting: The intermingling of fibres as in the formation of a web on a paper machine or in the manufacture of a nonwoven fabric.

Female Thread: The internal thread in pipe fittings, valves, machine parts, etc, for making screwed connections.

Ferro Prussiate Paper: A type of paper with good wet strength and dimensional stability, well sized, free from iron and other impurities, sensitized with a light sensitive coating to yield a print from a tracing with a white image against blue background.

Festoon Drying: A method of air drying. The paper is hung in a single continuous web, in short festoons or loops, on travelling poles or slate moving through a drying chamber in which the temperature and humidity are controlled. This type of drying is used for paper after tub sizing or coating and for wallpaper after printing.

Fibre: A thread-like body or filament, many times longer than its diameter. Paper pulps are composed of fibres, usually of vegetable origin, but sometimes animal, mineral, or synthetic, for special types of paper.

Fibre Axis Ratio: Ratio of fibre width to fibre thickness.

Fibre Binding: The interfibre cohesion between adjacent fibres in a sheet of paper arising from the hydrogen bond developed between hydroxyl group of the carbohydrates.

Fibre Cut: A paper defect occurring as a small, straight smooth, randomly located cut in the paper sheet caused by a larger than normal, less compatible fibre or shive passing through high-pressure roll nips.

Fibre Debris: Pieces of the fibre wall which may have been separated from the body of a fibre.

Fibre Flexibility: The ability of a fibre to bend or deform.

Fibre Network: The orientation of fibres in suspensions relative to one another. This action allows them to exhibit such properties as improved tensile strength, shear strength, elasticity, and extensibility.

Fibre Saturation Point: The point where all water is evaporated from the cell cavities of fibre but the cell walls are still fully saturated with water.

Fibreboard: (a) A general term to describe a board made from chemical pulp, waste papers, other waste materials, or a combination of such materials, with or without the addition of chemicals. Its principal uses are for luggage, containers, electrical products, and shoes. (b) A term sometimes used to designate container boards in general, as well as trunk board and

other produces of this character. (c) Often a designation for vulcanized fibre.

Fibrizing: A process for the reduction of fibre aggregates to individual fibres from such sources as wood chips, pulp sheets dry broke, reclaimed paper stock and the like. It is usually accomplished by mechanical equipment such as disk mills, conical refiners, vortex pulpers, etc. The raw materials may or may not have been softened by water, steam, or chemical treatment prior to mechanical action.

Fibrage: A continuous layer of fibres of uniform thickness such as those caught on the leading edge of bars on a beater of refiner as they move through a stock slurry.

Fibre Composition: The fibrous constituents of a paper or board and their various proportions in it. It is usually expressed in percentage figures by weight taking the total fibrous material of the paper or board as 100 parts.

Fibril: Fine, thread-like components of the cellulose fibre structure which are loosened and may become partially separated from the wall during mechanical refining. Also referred to as Fibrillae.

Fibrillation: In the pulp refining process, the loosening of threadlike elements from the fibre wall to provide greater surface for forming fibre-to-fibre bonds. Also called brushing out.

Fill: The maximum trimmed width of paper or paperboard that can be made on a given paper machine.

Fill Factor: A term applying to chip feeding devices such as used on continuous digesters. It is related to the area or volume a fixed amount of chips will occupy in the displacement chambers moving the chips.

Filled Board: Board (made on a cylinder machine) containing inner plies of a different stock from that of the outer or liner plies. Since this applies to virtually every grade of cylinder board, the term is seldom used today. It is more common to specify when a board is not filled by the prefix 'Solid'.

Filler: (a) A material, generally nonfibrous, added to the paper making furnish prior to sheet formation to improve various properties such as brightness opacity, formation, smoothness and also to save costlier pulp. (b) In paperboard, the inner ply or plies of a multiple layer.

Filler Clay: A kaolin or other type of clay which is added to the paper-making furnish prior to sheet formation to increase opacity, brightness and printing smoothness.

Film Coated: Paper with a pigmented coating that is lighter in weight than on conventional coated papers. It provides a more uniform and smoother surface.

Filter: Any kind of device which can be used to remove or partially remove suspended solids from a liquid or gas.

Filter Aids: A material, such as diatomaceous silica that is added to dilute pulp suspension that is to be filtered in order to prevent immediate blocking of the filtering mediums by the fines and colloidal constituents as typically done to white water in a paper mill.

Filter Paper: A porous, unsized paper for filtering solid particles from liquids or gases. It is made from cotton fibre or chemical pulp or both. Important properties are uniformity of formation, moderate strength when wet, high retention of particulate matter, high filtering rate and usually, high chemical purity. For most purposes, the pore size is carefully controlled, since this determines, the speed of filtration and the size of particles removed from the fluid (liquid or gas). For analytical filter paper, the ash content should be as low as possible. Industrial filter papers are used on filter presses, automobile filters and machines in the chemical and allied industries for the removal of foreign particles or clarifying solutions. Those industrial filter papers are interchangeably known and used as blotting papers in that they are used because of their absorptive quality rather than for their filtering quality.

Filtration: The process of passing a liquid through a filtering medium (which may consist of granular material, such as sand, magnetite, or diatomaceous earth, finely woven cloth, sintered glass/porcelain or specially prepared paper) for the removal of the suspended or colloidal matter.

Filtration Rate: The rate at which liquid is fed through a filter, expressed in gallons per minute per square foot or litres per minute per square meter/cm, of filter media surface.

Fine Papers: A broad term used for high quality printing, writing and cover papers and low grammage papers.

Fines: Very short pulp fibres or fibre fragments and ray cells. They are sometimes referred to as flour or wood flour.

Finish: The surface characteristics of a sheet determined by its surface contour, gloss, and appearance. It is usually determined by inspection.

Finish Variation: Marked change in surface smoothness or gloss within a roll or between rolls on either the felt or wire side.

Finishing: The various operations in the manufacture and packaging of paper performed after it leaves the paper machine. Finishing operations include super calendering, plating, slitting, rewinding, sheeting, trimming, sorting, counting, and packaging, Ruling

punching, pasting, folding and embossing are also sometimes considered as finishing operations.

Finishing Broke: The waste paper resulting from the various finishing operations.

Finishing Paper: An abrasive paper used for hand sanding, usually with a base of fourdrinier chemical pulp paper, which is coated with aluminium oxide, silicon carbide, garnet, or flint (quartz) using an animal glue as the abrasive bond. This paper is tough and flexible.

Finishing Room: The department of a paper mill where the paper is cut, trimmed, sorted, counted, packed and prepared for shipment.

Finishing Waste: Trimmings, cuttings, and other scraps of paper produced during the finishing operations in a paper mill which may or may not be recycled and reprocessed again into paper or paper board.

Fire Lane: Clear space around log piles, chip piles, mill buildings, and equipment suitable for fighting operations by personnel and motorized fire apparatus.

Fire Tubes: The piping section of a boiler which is surrounded by water and through which the flue gases pass.

Fire Work Fuse Tissue: Light weight paper generally used for making fuses for fire crackers. Important properties are good physical strength and high air permeability (porosity).

Firecracker Paper: A paper made to give sheets with deckle edges from which strips can be cut counter to the machine direction. In wrapping the firecrackers the deckle edge serves to terminate the roll without leaving a sharply cut edge.

Fireproof Crepe: Any crepe paper treated with chemicals to resist flame and used for decorative purposes in public places where fire is a hazard. It is made in a variety of colours.

Fireproof Paper: Any paper that is treated with chemical so that it will not support combustion. It is not actually fireproof but is self-extinguishing and will not propagate a flame. Fire resistant is generally considered a more accurate term since no paper is fireproof unless it is made entirely of inorganic fibres such as asbestos, ceramic or glass.

Fireworks Paper: Bright-coloured paper used in the manufacture of fireworks. This is a mechanical and chemical pulp paper made in light weights and sized to take paste. There are no special strength requirements.

Firing Hood: A refractory-lined steel plate enclosure around the discharge of firing end of a lime kiln.

Firmware: Types of programs used in many pulp and paper process computers which are placed into read-only type memories.

First Effect: The first vessel of a multi-effect evaporator in which live steam is usually introduced into the system and the concentrated black liquor leaves the system.

Fish Eyes: (a) Small, round, glazed or transparent spots resulting from slime, underfibred portions of stock, or foreign materials, which are crushed in calendering the sheet. (b) Round transparent spots in the surface of coated board, which may be caused by excess defoamer.

Fish Paper: Paperboard specially prepared and treated with chemicals, for use as electrical insulation in the manufacture of motors and dynamos.

Fish Wrapper: A vegetable parchment paper or a waxed paper which possesses some wet tensile strength and does not impart an odour to the fish wrapped therein.

Fittings: Fixtures and various accessories used to adapt and adjust parts to piping, machines and other equipment in and around a pulp and paper mill.

Fixing: A term used in the colouring of paper that refers to the combining of a dye, which has little affinity for the fibre, with a mordant, which adheres to the fibre, in order to produce the desired colour.

Flag: (a) A small piece of paper or similar material placed in a roll so that it extends beyond the end to denote a splice or a defect. (b) To insert a marker to denote a splice or a defect.

Flaking: The separating of the coating material from a coated sheet in the form of flakes.

Flakt Dryer: (a) A wet pulp sheet dryer designed to remove moisture by blowing hot air over and under the suspended sheet. Manufactured by Flakt drying systems. (b) Certain types of similar hot-air dryers used on pulverized fuels such as hot fuel, coal, pellets, etc.

Flame-Proofed (Paper or Board): Paper or board which has been given a treatment designed to give it a certain degree of non-flammability or of incombustibility or both.

Flame Resistance: The resistance of treated paper or paper-board to the spread of flame when ignited.

Flange: (a) Large, metallic, circular plate-like fittings which are installed on a pulp grinder shaft, on either side on the pulp-stone and to hold it in position. (b) A type of fitting on equipment, such as ends of pipelines, to provide a means of joining or connecting them.

Flash Drying: A technique in drying pulp in which thickened, disintegrated pulp drops into the suction side on a fan. The fan carries combustion gases from an oil burner into a drying tower. The pulp is later separated from the combustion gases and the process repeated until the proper dryness is achieved.

Flash Mixing: The rapid and uniform distribution of a coagulant through the mass of raw water which takes place in the mill water treatment process.

Flash Point: The temperature at which a fluid first gives off sufficient flammable vapour to ignite when approached with a small flame or spark.

Flash Steam: The steam produced when pressurized hot liquid enters into a lower pressure chamber. Example are liquids extracted from digesters and condensate removed from paper machine dryers.

Flash Tanks: Vessels into which pressurized hot liquid is introduced at a lower pressure so that steam will be produced and recovered for reuse in the process.

Flat: Paper or board supplied in sheets, not folded, as distinct from rolls.

Flat Box: Suction boxes equipped with drilled or slotted covers, over which the machine wire slides, so that water and air are pulled from the wet paper sheet being formed on the wire.

Flat Crush Resistance: The resistance of the flutes in single-faced or single-wall (double-faced) corrugated board to a crushing force applied perpendicularly to the surface of the board under prescribed conditions.

Flat Dryers: Conveyor-type dryers used to dry coated papers. Also called ladder dryers or tunnel dryers.

Flat Finish: A smooth finish free from glare.

Flat Paper or Board: Paper or Board which comes from the mill in flat sheets, without fold or crease. The term is applied especially to writing papers in packages of flat sheets of standard sizes and finishes.

Flat Screen: A general type of screen used for fine screening. It consists of a long rectangular box with three blank sides and an outlet on the fourth side. The outlet is fitted with flat, slotted metal plates over which the pulp suspension is allowed to flow. Screening action is induced by vibrating diaphragms below the plates. The diaphragms produce pulsations in the stock suspension causing acceptable fibres to pass through the slots with showers removing the rejected material at the end of the screen box for subsequent rescreening and final rejection.

Flat Wrappers: A general term applied to wrapping paper which has been put up in bundles of flat sheets instead of folded.

Flat Writings: (a) Usually school flats and tables paper. (b) Writing paper with a smooth, flat finish as distinguished from a bond finish.

Flatness: Condition of paper or board when it has no curl, cockle or wave.

Flax: The bast fibre of the flax plant (*Linum usitatissimum*).

Flex Resistance: The ability of paperboard to withstand a centre load with minimum bending while suspended at the end.

Flexible Blade Coating: See Blade Coating.

Flexible Fibre: A grade of Vulcanized fibre (q.v.) made soft and resilient by incorporating a plasticizer to make it suitable for gaskets, packing and similar nonelectrical applications. It is made in thicknesses from 0.4 to 11 mm (1/64 to 7/16 inch) usually in red, black or gray.

Flexural Resistance: The resistance of paperboard to deflection when a specimen is supported at the ends and a load is applied in the middle of the span. This property is of interest in connection with bookbinding boards and rigid insulation boards.

Flexural Stiffness: See Stiffness.

Flint Glazing: A method of importing a hard, brilliant polish to paper more especially to coated papers, by means of rubbing with a smooth stone or stone burnisher on a flint glazing machine. Now-a-days this process is performed by means of a friction glazing calender.

Flint Paper: An abrasive paper (q.v.) in which the base paper is a kraft sheet coated with flint (quartz) with a glue bond. This is the common hardware-stone type of sandpaper for hand sanding. Aluminium oxide flint paper are also popular hardware store items.

Flitting: A condition in which a paper web flaps between top and bottom rolls as it leaves the nip. It is most likely to happen between applicator rolls during some method of coating.

Floating Drier: A term applied to the first drier, after the doctor, on some semicrepe tissue machines. It runs at a slower speed than the drier rolls immediately following, or permitting a higher crepe ratio than would be possible without it.

Floc: Small, gelatinous masses formed in a liquid by the addition of coagulants through a biochemical process, or by agglomerations, commonly occurring in water and waste treatment processes.

Flocculation: In water and wastewater treatment, the agglomeration of colloidal and finely divided suspended matter after coagulation by gentle stirring by either mechanical or hydraulic means. In biological wastewater treatment where coagulation is not used agglomeration may be accomplished biologically.

Flock: (a) Very short or pulverized wool, cotton, or rayon fibre used to create patterns on cloth or paper used for wall and other types of coverings. (b) Agglomerated bundles of fibres that become suspended in stock slurries.

Flocking Tissue: Highly finished tissue, usually with a grammage from 17 to 20 g/m² which is used in textile manufacture to protect dress and other thin materials

which are printed. The high finish prevents the tissue from linting onto the fabric with which it is used. This paper is also designed interleaving tissue.

Flong: Paper or board used for making the mould for casting stereotypes. *See* Matrix Board.

Flooded Nip Coated: A type of paper coater where the sheet wraps a backup roll and excess coating is applied by a rotating roll forming a nip. The nip becomes flooded with coating material.

Flotation: By this process ink and other non-fibrous portion of a waste paper pulp are separated. The waste paper, newspaper, printed paper, etc, are pulped and mixed with certain foam creating chemicals. When air is blown into the slurry, the ink particles get separated from the pulp fibres and float along with foam which is subsequently removed and clear pulp is separated.

Flow Eveners: Paper machine headbox assemblies such as explosion-proof chambers, tapered ducts, rotating perforated rolls, vanes, baffles, etc, designed to even out the streaky, turbulent flow and large cross eddies coming from the spreaders of the approach flow system.

Flow-on-coating: Flow-on-coating consists of flowing a suspension of pigment and adhesive directly onto the wet web as it is being formed on a fourdrinier paper making machines.

Flow Sheet: A diagram, chart, or outline showing process material flow direction, successive operations, and equipment used through which the materials flow during a manufacturing process.

Flow Box: A flow control device consisting of a box-like chamber which receives the fluids and evens out the flow by allowing the fluid to flow between and over a set of baffles and returning the excess. Once, it was a very common method used to control the flow of pulp stock slurries to paper and pulp mill process equipment, such as washers, filters, save-alls, screens, and both fourdrinier and cylinder types of paper machines.

Flowmeter: A meter that indicates the rate at which a liquid flows through the plant or any pipe line.

Flue Gas: A mixture of gases resulting from combustion and emerging from a chimney or stack.

Flue Gas Scrubber: Equipment associated with power and recovery furnaces that removes fly ash and other materials from the flue gas by the use of sprays, wet baffles, or other means that require water or other liquids as a primary separation mechanism. Also referred to as flue gas washer.

Fluff: Dust from paper which gathers on the rolls or doctors or a paper machine or on the rolls of a printing press.

Fluff Pulp: A chemical, mechanical or combination of chemical-mechanical pulp, usually bleached used

as an absorbent medium in disposable diapers, bedpads and other personnel hygienic products. Also known as Fluffing or comminution pulp.

Fluid Head: The pressure measured in relation to and expressed in terms of the height of a column of fluid of known density. It is computed by dividing the pressure by the density.

Fluidity: The reciprocal of viscosity. The unit of fluidity is the rho.

Fluidized Bed Technique: A combustion process in which heat is transferred from finely divided particles to combustible materials in a combustion chamber. The materials are supported and fluidized by a column of moving air.

Fluidizer: Process equipment used to maintain a mass of finely divided solids in a turbulent, dense state during treatment by dispersing it in an upwardly moving gas stream. This imparts to the mass a turbulence resembling that of a boiling liquid.

Fluidizers: Chemical compounds which decrease the viscosity and reduces the thixotropy of pigment dispersions both in the initial dispersion, and in the pigmented coating colour.

Flume: A channel, either natural or man-made, that carries both liquids and materials suspended in the liquid.

Fluorescence: (a) That property of substances that causes them to emit radiation as the immediate result of and only during the absorption of incident radiant energy of different wave-lengths. (b) The radiation emitted in this process. The fluorescent radiation usually has a longer wavelength than the exciting radiation. When irradiated by ultraviolet light, the fluorescent radiation is often visible. This phenomenon is the basis of 'optical brightness'. Substances which are added to paper so that when illuminated by daylight or other light containing ultraviolet the paper fluoresces and appears brighter.

Fluorescent Brightners: Types of dyes used to increase the apparent brightness of white paper by absorbing some of the invisible ultraviolet radiation and re-emitting it in the violet and blue portion of the spectrum. *See* Fluorescent Dyes or Optical Brightness.

Fluorescent Dyes: Synthetic dyestuffs used for enhancing the brightness of white paper. These materials absorb ultraviolet light and re-emit it on a higher wavelength (usually in the violet end of the spectrum) thus increasing the 'blueness' and 'brightness' of the paper as seen by the eye.

Fluorescent Paper: A paper containing a fluorescent material which absorbs ultraviolet 'black' light and re-emits it in the visible spectrum. Such papers glow brilliantly in various hues (depending on the fluorescent agent) when illuminated by ultraviolet energy. Bluish fluorescing colourless dyes or

pigments are commonly employed in white papers to enhance brightness when viewed in daylight which contains some ultraviolet energy. This phenomenon is often referred to as optical bleaching.

Fluorescent White: (a) A term descriptive of fluorescent dyes or pigments colourless as applied to 'white' paper or paperboard but which increase the brightness by absorbing the ultraviolet energy or daylight and re-emitting it as visible light. (b) 'White' paper or paperboard containing such fluorescent material.

Flute: The geometric configuration formed by one of the undulations of the corrugated medium in corrugated board. The exact dimensions of the flute will vary slightly depending on corrugating roll contour, material characteristics, converting equipment, and technique. The three common types in conventional corrugated board used in shipping containers and boxes are A-, B- and C- flute generally 3/16, 3/32, and 5/32 inch high, respectively (not including the thickness of the liners). The numbers of flutes per foot are approximately 34-36, 50-52, 39-42, for A, B and C, respectively. E-Flute, approximately 1/16 inch high and spaced about 88-100 flutes per foot, is used mainly in corrugated board for folding cartons.

Fluting Media: A paper to be used for forming the fluted structure in corrugated paper and board (*See* 'Corrugating media').

Fluxing: Cleansing by dissolving or melting a substance through chemical action.

Fly Ash: Entrained, partially burned dust, soot, and other materials and chemicals that are carried over with the flue gases emitted from the smoke stacks of power and recovery furnaces.

Fly Bars: Knives located on the surface of beater rolls.

Fly Finish: *See* 'Book Fashion Inspection'.

Fly Roll: A nondriven roll used on cylinder-type machines strictly to support the felt.

Flying Bridge: A catwalk located between the wet ends of adjacent paper machines in a multi-machine paper mill. On the catwalk the operator can observe the entire length of the machine. Normally it is movable so it can be swung out of the way, if necessary, when the wire is changed.

Foam: A mass of air bubbles formed in or on the surface of liquids and pulp slurries due to air entrainment during agitation or other mechanical disturbances. Also called froth.

Foam Breaker: Mechanical devices normally installed at the top of liquor stock, or any other storage area where stable foam may form. Its purpose is to break up the foam.

Foam Marks: Marks caused by foam in the stock as it comes onto the paper machine wire. Such marks may also occur in coated paper. Also called foam spots.

Foam Spots: *See* Foam marks.

Foil-Mounting Paper: A paper for mounting metallic foils for protective and decorative purposes. Smoothness, uniform caliper and freedom from alkali are important characteristics. A wide variety of grades of foil mounting paper is employed depending on end-use requirements and laminating processes.

Foil Paper: A paper laminated with metal foil.

Foil Polish: A term indicating that the brightness of a sheet is due to light reflection.

Folder: (a) A circular or other piece of direct advertising material which is folded before mailing. (b) A heavyweight sheet, folded once and used for filing purposes. (c) A grade of boxboard suitable for scoring and folding.

Folder Stock: A board or bristol used for the manufacture of folders for business filing. It is commonly made of chemical pulp and reclaimed paper stock, though some grades are made from hemp or jute stock. Common thickness are 0.20 mm, 0.28 mm and 0.35 mm (0.008, 0.011 and 0.014 of an inch). It may be surface sized or treated to give greater wearing qualities. Significant characteristics include tearing resistance, stiffness, folding and non-curling properties, and uniform high finish without mottle.

Folding Boxboard: A paper board suitable for the manufacture or folding cartons which can be made from a large variety of raw materials on either a cylinder machine or a fourdrinier machine or a combination machine. It possesses strength qualities that permit scoring and folding and has variable surface properties depending upon the printing requirements. This classification includes such products as claycoated boxboard, white patent coated news, manila lined news, and fourdrinier bleached kraft board.

Folding Endurance: The number of folds under specified conditions of testing in a standard instrument which a paper will withstand before failure.

Folding Paper Box: A container (other than solid fibre or corrugated shipping container) which is the product of a cutting and creasing (die-cutting) operation on relatively lightweight folding boxboard. The carton is capable of being folded flat for shipment by the fabricator in contrast to the setup box which is sent out already formed. The carton is usually formed up, filled, and closed by the user. It is produced in many styles, shapes, and sizes, of which the four-sided style with flap closure at ends or top and bottom is the most important.

Folding Stock: Paper made from a strong long-fibred chemical pulp sometimes mixed with rag pulp to be

coated with a coating mixture that is plastic enough not to crack when folded and opened. This paper is made in a wide variety of grammage.

Footcandle: A unit of illuminance, based on 1-square foot-surface area on which a time rate of flow or radiant energy of 1 lumen is uniformly distributed.

Forced Air Dryer: A type of paper dryer that used forced hot air impinging on the surface of the paper through specially designed nozzles in order to enhance moisture removal.

Forced Circulation: The recycling of digester cooking liquor by withdrawing it from one or more points in the digester and pumping it, sometimes through a heat exchanger for heating, back into the digester at one or more locations.

Forced Draft (FD): Positive low pressure created by air furnished to a power or recovery boiler by a fan or blower for improved combustion.

Forced Draft (FD) Fan: A fan that is used to force air through an air heater and into a furnace.

Foreign Particles: Particles other than fibre, embedded in the pulp, appearing opaque when viewed by transmitted light, and having an area not less than 0.02 mm^2 .

Forest Genetics: The basic science dealing with causes of differences and similarities among trees related by descent. Genetics takes into account the influence of the genes and environment on tree growth and utility.

Forest Residues: Comprises chips, particles, and fibres arising as by-products of logging operations including culled material, slash, limbs, saplings, etc. Also includes other secondary forest material not usually defined as logging residues, such as tops, branches, standing saplings, and cull trees, etc.

Forest Tree Improvement: The applied science of systematic genetic improvement of a species or a population. Employed are such techniques as selection, hybridization (combining parents of unlike genetic makeup), and mutations (the change in structure or number of basic units of inheritance). The term is sometimes also applied to the improvement of trees or stands via non-genetic means such as the use of chemical growth stimulators.

Form Bond: A lightweight commodity paper designed primarily for printed business forms. It is usually made from chemical and/or mechanical pulps. Important product qualities include good perforating, folding punching and manifolding properties. The most common end use for this grade is a carbon-interleaved multi-part computer printout paper which is marginally punched, cross-perforated and fanfolded.

Formation: A property which is determined by the degree of uniformity of distribution of the solid components of the sheet with special reference to the fibres. It is usually judged by the visual appearance of the sheet when viewed by transmitted light. This property is very important, not only because of its influence on the appearance of the sheet but because it influences the values and uniformity of values of nearly all other properties.

Formazin Turbidity Units (FTU): A measure of the turbidity of water.

Forming Board: A broad flat board with or without holes or slots, situated just after paper machine head box, under the wire, over which the pulp stock impinges from the slice. It helps in uniform distribution of web and also controlling the drainage over the early part of the fourdrinier wire.

Fortified Size: A chemically modified rosin acid used in place of or in combination with, rosin size for producing improved water resistance in paper and board.

Fourdriner Machine: The fourdrinier machine, named after its inventor with its modifications and the cylinder machine (q.v.) comprise the machines normally employed in the manufacture of all grades of paper and board. The fourdrinier machine may be divided into four sections, the wet end, the press section, the drier section and the calender section. In the wet end the pulp or stock flows from a headbox through a slice onto a moving endless belt of wire cloth, called the fourdrinier wire of brass, bronze, stainless steel, or plastic. The wire runs over a breast roll under or adjacent to the headbox, over a series or tube or table rolls or more recently drainage blades which maintain the working surface of the wire in a plane and aid water removal. The tubes or rolls create a vacuum on the downstream side of the nip. Similarly the drainage blades create a vacuum on the downstream side where the wire leaves the blade surface, but also performs the function of a doctor blade on the upstream side. The wire then passes over a series of suction boxes, over the bottom couch roll (or suction couch roll) which drives the wire and then down and back over various guide rolls and a stretch roll to the breast roll. The second section, the press section, usually consists of two or more presses, the function of which is to mechanically remove further excess of water from the sheet and to equalize the surface characteristics of the felt and wire sides of the sheet. The wet web of paper, which is transferred from the wire to the felt at the couch roll, is carried through the presses on the felts.

There are two modifications of the fourdrinier in use, known as the Harper and the so-called Yankee or M.G. machine which in principle are similar to the fourdrinier machine.

Papers varying in grammage from lightweight tissue to heavy paperboard are made on the fourdrinier machine.

Fourdrinier Board: Board made from a Fourdrinier machine (q.v.).

Fourdrinier Wire: An endless belt woven of plastic or metal for use on the fourdrinier machine on which belt the fibres are felted into pulp, board and paper. The 'warp' wires are the ones in the machine direction while the 'shute' wires are in the cross machine direction. The weave configurations are constantly being expanded to fit the various drainage and sheet requirements in the industry.

Foxing: Stains, specks or spots in paper, for example prints or books mostly caused by mold or mildew.

Fractionators: A device that separates various length fibres in a pulp slurry. It is commonly used to determine the size of the various fractions of the pulp.

Frame: The supporting structure of a paper machine.

Free Chlorine: Elemental chlorine in the pulp bleaching process which is in solution and not consumed with lignin elements in chlorinated pulp slurries.

Free Delivery: The theoretical operating condition when static pressure and resistance in an air system equals the forced draft.

Free Rosin Size: Rosin that is intentionally not completely saponified when making up rosin size by boiling rosin with caustic soda or sodium carbonate. It therefore contains rosin acids. Generally free rosin size is used where fresh water possesses high carbonate/bicarbonate hardness.

Free Sheet: (a) Paper free of mechanical pulp. (b) A paper made from pulps having a high freeness or faster draining stock.

Free Stock: A pulp suspension from which the water drains freely.

Free Water: Moisture in a sheet of paper that is not bound chemically or mechanically with the fibres.

Freeness: A rate at which water drains from a stock suspension, through a wire mesh screen or a perforated plate. It is also known as slowness or wetness, according to the type of instrument used in its measurement and the method of reporting results. Generally Schopper Reigler (SR) or Canadian Freeness Tester (CFS) are used to determine freeness of pulp stocks.

Freeness Value: The proportion of dilution water recovered from a sample of stock by drainage, measured by a standard method.

French Folio: A lightweight writing paper used for second sheets and for taking printers' proofs. It is also used for overlays and underlays in make ready in a printing plant. It is usually made from bleached chemical pulp in white and various colours. It is smoother than most manifold papers and has no specific strength specifications.

Frequency: The number of cycles through which an alternating electrical current passes per second that is the reciprocal of the period. Also applicable to any other reciprocating or cyclic process, such as paper machine shake, vibrating screens, etc.

Frequency Converter: A piece of electrical equipment that converts the power of an AC system from one frequency to another, with or without changes in the number or phases or in the voltage.

Fresh Water: Water entering the pulp and papermaking process from the source for the first time and which has not been reclaimed or recycled from the process.

Friction Calender: Usually consists of three rolls, the bottom of chilled iron, the intermediate roll of cotton and the top roll of chilled iron, bored so as to admit steam. It has a burnishing action of the paper.

Friction Glazed: A term applied to paper which has a very high finish secured by passing the sheet through chilled iron rolls revolving at different peripheral speeds. This process is used largely in finishing coated box-lining papers, waterproof papers, bronzed and silver papers, etc.

Front Side: The operating side of a paper machine; the side opposite to the drive side (back side).

Frown Profile: A cross-machine moisture scan measurement made on the felt in the press section of a paper machine. It produces a gradual negative to positive to negative shaped trace record. It is the opposite of smile profile.

Froth Mark: See Foam Marks.

Frozen Foods Papers: A type of highly moisture- and water-vapour resistant papers used for inner liners in frozen-foods packaging. They are usually glassine or bleached chemical pulp paper specially treated for high water-vapour resistance, waxed papers and plain, coated, or waxed vegetable parchments are also used. They are pliable so as to resist cracking under the low temperatures employed in quick-freezing and storage of foods. Properties required are stripping quality, strength and flexibility, resistance to penetration of liquids and vapours, high wet tensile strength, and purity.

Frozen Smelt: Layer of smelt that builds up on the chrome ore refractory bottom of a sulphate black liquor recovery furnace. It is on this surface that the fluid smelt flows to the smelt spouts.

Fruit Wraps: Lightweight M.F. or M.G. papers used to wrap or pack fruit. They are made in white and colours, in a variety of furnishes to meet specific requirements. Some grades are given a special mineral oil or other treatment to prevent 'scalding', retard decay, or decrease shrinkage of the fruit. This treatment must not impart odour and must not have any harmful effect on the taste of the fruit. Fruit wraps may be plain or printed and are supplied in various sizes.

Fuel Air Ratio: The ratio of fuel to air in the combustion mixture at the burner of a furnace.

Fuel Bed: The layer of solid fuel or solid waste material on the grate or hearth of a power furnace.

Fuels: Materials used to produce heat or power by burning such as coal, coke, oil, gas, and wood. Black liquor is also burned in the pulp mill but its primary objective is to recover chemicals from it, with the heat produced as a by-product which is used for captive power generation.

Fugitive Colours: Paper and paper board colours which are susceptible to fading and damage by light and substances such as acids, caustics, and bleaching-type chemicals.

Fulling: An operation where the felt is wetted by a soap solution and then passed through a series of vertical and horizontal rollers. The mechanical action thickens and compacts the felt, and the pressures induce a mechanical interlock of the individual fibres thereby increasing the strength and wearability of the felt.

Fully Cooked Pulp: A pulp that has been cooked to the extent that, when discharged from the digester, the mechanical action in emptying the digester reduces the chips to their fibre components, allowing them to be pumped without additional mechanical treatment.

Fume: Tiny solid particles commonly formed by the condensation of solid matter vapours.

Fungi: Small, often microscopic, plants without chlorophyll. They are useful for breaking down waste and stabilizing sewage. They also grow on wood and produce undesirable effects on paper and paper products under dark, damp storage conditions.

Fungicides: Chemical substances used to prevent the potential growth of fungus on wood and paper.

Furnace: The chamber of an incinerating system where drying, ignition, and combustion occur.

Furnace Pressure Interlock: An interlock system on a recovery furnace that senses pressure and at a preset value, automatically initiates a sequence of events for shutdown.

Furnish: The mixture of various materials that are blended in the stock suspension from which paper or board is made. The chief constituents are the fibrous

material (pulp), sizing materials, wet-strength or other additives, fillers and dyes.

Furnish Layer: Stratum made up of one or more plies of the same furnish, combined while still moist, without the use of adhesive.

Furnish Shrinkage: The percentage of the original furnish to the paper machine that is lost in the papermaking operation.

Furniture-Wrapping Paper: A common heavyweight wrapping paper, generally made of screenings, reclaimed paper stock, or kraft, which is used to protect furniture against damage in transit and while in storage.

Fuse: An electrical element designed to melt or dissipate at a predetermined current value to protect against abnormal conditions or current.

Fuse Paper: A strong sheet with feather deckles (similar to cartridge paper), usually red. It is used in the manufacture of fuses for railway and track signal purposes.

Fusion Point: The temperature at which a particularly complex mixture of minerals can flow under the weight of their own mass.

Fuzz: (a) That property which causes a sheet to exhibit fibrous projections on its surface or to develop such fibrous projections in use. (These two interpretations of the property might more descriptively be called 'Fuzziness' and 'Fuzzability', respectively). (b) Fibres projecting from the surface of a sheet of paper. They may be due to improper refining or excessive vacuum during sheet formation.

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Gage Pressure: The pressure in a system that is measured in relation to the pressure in the surrounding atmosphere.

Galactomannan: *See* Mannogalactany.

Galley-Proof Paper: Long sheets of paper having sufficient width to take proofs from type standing in galleys. The nature of the paper is not important as long as it will take a clean impression of the type.

Galvanic Corrosion: Corrosion caused by tiny electric current passing through two metallic surfaces of different composition.

Galvanized Appearance: An uneven sheet surface appearance resembling galvanised metal caused by variations in smoothness or gloss.

Gamma-Cellulose: That portion of cellulosic material that dissolves in the alkaline solution under the conditions of the alpha cellulose determination and remains in solution on neutralization of the alkaline solution.

Gangue: The worthless portion of a slurry from which useful material was separated by flotation or some other type of fibre recovery process.

Gantry: A crane mounted on two movable supports running on rails and high enough to allow vehicles to pass under.

Garnet Paper: An abrasive paper used for handwork in the wet or dry sanding of easily abraded surfaces. The base paper is a kraft sheet which is coated with garnet using a varnish resin adhesive.

Gas Burner: A furnace component used to feed fuel gas and air with the necessary velocity and turbulence to produce proper ignition and combustion of the gas within the furnace.

Gas Contact Evaporation: A method of evaporation of liquor before delivery to the recovery furnace. It is carried out by contact with the hot flue gases from the furnace.

Gas Igniter: A supervised gas burner in a furnace, usually ignited by a spark and used to continuously provide sufficient energy to produce proper operation of on associated hearth or other combustion burners under a variety of lighting off and firing conditions.

Gas Off: A common pulp mill term referring to the removal of non-condensable gases formed during the cooking of chips in batch-type digesters.

Gas Phase Bleaching: The bleaching of pulp by the addition of gaseous chemicals such as chlorine, ammonia, and chlorine dioxide.

Gas Phase Chlorination: The chlorination of unbleached pulp by the direct addition of gaseous chlorine.

Gas Scrubber: Equipment used to remove recoverable components from a gas stream by the use of an atomized stream of process liquid or water.

Gasket Board: A paperboard which is subsequently treated with chemicals and cut into gaskets. It is usually a chipboard or woodpulp board without special finish, but which has absorbent properties.

Gaskets: Various materials shaped and fitted to pipe joints and other similar connections to make them leakproof. Many gaskets are made of paper treated with special additives such as phenolic resins.

Gate: An adjustable partition on a stock flow box that is used to regulate the rate of flow of stock slurry. Also referred to as a slot.

Gate Valve: A type of valve used extensively throughout the pulp and paper industry, particularly as manually operated shutoff valves although some are automatically operated. They are characterized by a flat, wedged-shaped, sliding element which is positioned with a linear motion in the body and against the seat by a stem.

Gauges: Instruments and devices used to measure and indicate product dimensions and process variables such as thickness, length, height diameter, pressure, level, temperature, etc.

Gear: A machined element connected to the moving part of a machine in order to transmit motion. It usually consists of a wheel with teeth on its circumference which engage similar teeth on another wheel.

Gear Drive: A shaft terminating in a gear used to transmit rotary motion from a driving device, such as a motor, to other devices through companion gear connections.

Gearbox: A container housing a number of gears used to transmit, or reduce, or increase the speed of rotary motion of a driven shaft connected to a piece of process equipment.

Geiger Counter: An electrical device that detects the presence and measures the intensity of radioactivity.

Gel: A system composed of colloidal particles which form a jelly-like structure.

Gelatin: A colourless, odourless albuminous material extracted from animal bones, hides, etc. It is used as a high-purity alternative for glue in paper coating and sizing.

Gelatinization: A process used in the preparation of starch for use in papermaking which consists of cooking it in an aqueous suspension so that the granules swell to form a viscous solution.

Generating Tubes: The tubular elements in a boiler in which water is converted into steam.

Generator: A machine which transforms mechanical power into electrical power.

Generator Room: A room or area in the powerhouse of a mill where the electric generators are located.

Gift Wrapping Paper: Plain gift wrapping paper is made from chemical pulps. It may be white or coloured. Fancy or decorated gift wrapping paper is a sheet of good quality paper, decorated or embossed, or printed in one or more colours by any one of several printing processes. It is used to dress up a gift and enhance its eye appeal.

Gilling: The process of applying a high-gloss finish on paper with a 'gill' glazing machine.

Gland: The part of a pump that stops the pressurized liquid from discharging out around the rotating shaft.

Glass Fibre Felt: A mat made from glass fibres bound together with a synthetic resin.

Glass Flake: An electrical insulating material used with various types of pulp as a bonding medium to make special papers.

Glass Paper: (a) Paper made from glass fibres. (b) A term some times applied to abrasive papers.

Glass Transition Temperature: The temperature at which plasticized lignin in mechanical pulp changes to a brittle, glass-like state.

Glassine Paper: A supercalendered, smooth, dense, transparent or semitransparent paper manufactured primarily from chemical pulps, which have been beaten to secure a high degree of hydration of the stock. This paper is grease resistant, and has a high resistance to the passage of air and many essential oil vapours used as food flavouring and when waxed, lacquered, or laminated, is practically impervious to the transmission of moisture vapour. It is made in white and various colours; opaque glassines are produced by the addition of fillers. Glassine paper is used as a protective wrapper for all kinds of food stuff, tobacco products, chemicals and metal parts, as well as for many purposes where its transparent feature is useful. For these purposes it is often converted into bags envelopes, printed wraps, fluted cups, etc, it is also used for lining boxes, cartons and as windows in window envelopes. It is also called glazed greaseproof paper. The German name is 'Pergamyn'.

Glazed Coated Book Paper: Any coated book paper having a high supercalendered or glossy brush-finished or similar surface.

Glazed Paper: Having a high gloss or polish, formed on the surface of the paper by methods such as friction glazing, calendering, plating or drying on a Yankee drier.

Glazing: The operation of producing glazed papers or boards.

Globe Boiler: A rotating type spherical, batch-type digester used to cook rags in a rag pulp mill. It is rotated in order to mix material with chemicals during cooking besides loading rags and dumping the pulp when the cook is completed.

Globe Digester: A spherical-shaped, batch-type digester that sometimes rotates during the cooking process. Same as Globe Boiler.

Gloss: The geometrically selective reflectance of a surface responsible for its shiny or lustrous appearance. Gloss depends on the kind of illumination, the angles of its incidence and reflection and the kind of use of the paper and the relative position of the paper and the observer. Hence different tests have been devised for different kinds of paper and uses. Among them are: Contrast Gloss at 57.5° , for white and near-white writing and printing papers having a low gloss; Specular gloss at 75° , Primarily for coated papers and for most ink films; and specular gloss at 20° , for waxed papers and very glossy ink films. It is not certain what method is preferable for coloured papers, cast-coated or highly varnished papers or to evaluate distinctness-of-image gloss, absence-of-surface-texture gloss and other special applications.

Gloss Agents: Additives which improve the optical smoothness of the surface of a coated sheet and improve its ability to reflect incident light.

Gloss Calender: A device for obtaining gloss primarily on coated paperboard by means of a heated, highly polished roll nipped to a hard rubber ball which causes thermoplastic flow of coating binder.

Glossmeter: A paper mill laboratory test instrument used to measure the gloss or glare created by the surface of a sheet of paper. It operates by measuring the amount of light reflected from the sheet surface when exposed to a standard light source. Also called a Glarimeter.

Glue: Organic colloids of complex protein structure obtained from animal materials such as bones and hides in the meat packing and tanning industries. It is used for gumming, tub sizing, and as a general adhesive. It also serves as a coating adhesive for speciality products.

Glue Coated Paper: A coated paper in which glue is used as an adhesive for the coating material.

Glycerine Paper: A paper which has been impregnated with glycerine. It may be used for wrapping products which are to be protected from the moisture of the air; it is also used as a base for oil cloth and paper drapes and for making gaskets.

Gmelina: A fast growing hardwood species, *Gmelina arborea*, native to India but cultivated in other parts of the world for use in paper making pulp.

Go-Devil: A stiff piece of cardboard over which paper is usually looped and fed into the ingoing seal on slow-speed vacuum dryers.

Gold-Mailing Paper: A gold-coloured chemical mechanical pulp sheet which is moderately hard sized. It is used in hand addressing machines for labeling newspapers and magazines.

Gold Paper: Metallic bronze-coated paper. There are many kinds ranging from lightweights used in the paper box industry to heavy bristols.

Goldbeaters Tissue: An unbleached tissue paper which has a hard surface free from lint and is used as in interleaving between sheets of goldleaf.

Golden Brown: A shade of paper, usually kraft, used for wrapping paper, gummed tape, and kraft envelopes. The base stock may be unbleached or semi-bleached, and is usually coloured with a small amount of dye.

Governor: A device for regulating the power usage or speed of paper and pulp mill process equipment such as a pulp-wood grinder.

Grab: A power shovel commonly used for materials handling in and around a pulp and paper mill. It consists of a bucket fitted to a boom or swing hoist and

is attached to a mast or frame mounted on a truck, railroad car, or crawler tractor.

Grab Sample: A sample of pulp or paper for testing or analysis taken at random.

Grab Truck: Equipment employed to move rolls of paper from one location to another in a paper mill using two opposed clamps to grab and carry the rolls. Sometimes called a clamp truck.

Grade: (a) A class or level of quality of a paper or pulp which is ranked, or distinguished from other papers or pulps, on the basis of its use, appearance, quality, manufacturing history, raw materials, or a combination of these factors. Some grades have been officially indentified and described; others are commonly recognised but lack official definition. (b) With reference to the particular quality, one item differing from another only in size, weight or grain; for example an offset book paper cut grain long is not the same grade as the same paper cut grain short.

Grain: A characteristic of the surface of a paper caused by the preferential orientation of fibre during formation on the wire part in machine direction.

Grain Direction: See Grain or Machine Direction.

Grain Loading: The rate of emission of particulate matter from a polluting source. Measurement are made in grains (65 milligrams) of particulate matter per cubic foot of gas emitted.

Grained Paper: An embossed or decorated paper with a surface to imitate various grains, such as wood, marble, alligator, Spanish leather, etc. It is usually made in cover or box cover weights.

Graininess: In printing, the effect produced by a random pattern of light and dark specks or grains in halftones and solids. The grains can be due to roughening of the edges of halftone dots, random specks of ink between dots, discontinuous ink film on halftone dots and solids, specular reflections off inked fibres in the surface of the paper, etc. Graininess is caused by fine grains which cannot be easily resolved by the eye and should not be confused with mottle-large blotches due to uneven absorption or formation in the paper, or with wire patterns-which have regular rather than random distribution.

Grainy : Small variations in the surface appearance of paper or board, resulting from any of a variety of causes, such as impressions of wires or felts, irregular distribution of colour and uneven shrinkage in drying.

Grainy Edges: A grainy condition extending for varying distances in from the edge of the sheet, rougher than the rest of the sheet.

Grammage: Mass of the paper or paperboard in g/m² of its surface measured at standard testing conditions.

Granite: Lightly coloured or tinted and containing a small percentage (usually less than one percent) of heavily dyed, fairly long fibres of a different colour.

Granite Note: A mottled writing paper cut to note size and used for social correspondence. It is made by adding a fraction of a percent of heavily dyed long fibres to a furnish of white pulp. Blue, red and black are the most common colours for mottling fibres.

Granite Roll: A roll in the wet press of a paper machine of granite and usually located in the top of the press.

Graph Paper: Paper made to be ruled in both directions with parallel equally spaced lines. It is used for making charts and graphs.

Graphic Panel: A central control room operator's panel board with a process flow diagram depicting process equipment and associated recording and control instruments located in relation to their actual point of control in the process.

Graphite Paper: A paper made from stock which has been treated with colloidal graphite or which has been coated by spraying, painting or dipping with an aqueous paste of colloidal graphite. The paper is usually gray to gray black. The addition of graphite increases the opacity of the sheet, renders it less sensitive to colour changes by sunlight and gives the paper the properties of lubricity and electrical conductivity. Graphite may be added to paper of almost any basis weight.

Grate: The floor on which the burning fuel bed is formed in a solid fuel power furnace.

Gravity Deckers: A drum vacuum filter that is used to dewater stock slurries. The vacuum is created by the force of gravity on a falling column of water in a drop-leg connected to the inner portion of the wire-covered screen on which the pulp pad is formed.

Gravity Flow: The movement of material from a higher to a lower height due to the force of gravity alone.

Gravity Thickener: A type of filter used to remove water from a pulp slurry by allowing the water to fall away from the slurry by the force of gravity as it presses over a stationary or rotating screen.

Grease-Resistant Paper: Paper which resists the penetration of grease to an appreciable extent (*see also* 'Greaseproof paper').

Grease Spots: (a) Dirt spots in paper caused by oil or grease. (b) Positions of paper containing less pulp than the rest of the sheet, caused by a grease spot on the wire, which inhibits proper sheet formation.

Greaseproof Board: Any paperboard upon which there has been pasted a paper that is greaseproof, such as glassine, or a board that has been treated to render it grease and oil-resistant.

Greaseproofness: Ability to resist the passage of greases and oils. This property is important in papers used in packing greasy and oily substances.

Greaseproof Paper: (a) A protective wrapping paper made from chemical pulps which are highly hydrated in order that the resulting paper will be resistant to oil and grease. This paper is used extensively for wrapping greasy food products. (b) A descriptive term for any paper which has been treated or coated to render it resistant to grease or oils. A real greaseproof paper will give blisters, when exposed to a small flame momentarily.

Greasy: A term applied to a pulp which has been refined to a very low freeness and has a characteristic slippery or greasy feel. Such a pulp is sometimes referred to as dead beaten.

Green: Incompletely dried or seasoned.

Green Liquor: A liquid produced in the sulphate process by dissolving the smelt into a dissolving tank in weak washes from white liquor preparation plant.

Green Liquor Clarification: The removal of suspended solids (dregs) from green liquor, prior to causticizing in a pulp mill, by settling it in any one of several types of sedimentation units after flocculation.

Green Paper: Newly manufactured paper which has not had enough time to condition itself and equalize the moisture content.

Greeting-Card Bristol: A bristol selected for colour, finish, or other special characteristics and used for the manufacture of greeting cards. It may be an index bristol, a mill bristol, or a wedding bristol. Important properties are colour, finish, rigidity and sizing.

Greyboard: A homogeneous board made usually of mixed waste papers with or without screenings and mechanical pulp on a continuous board machine, in thickness not greater than 1 mm.

Grid Method: A laboratory procedure used for measuring fibre length and coarseness in which a predetermined sample is cast on a glass plate or slide and projected on a screen to determine the number of times the fibres pass a fixed grid pattern.

Grinder: A machine for producing mechanical wood pulp or groundwood. It is essentially a rotating pulpstone against which logs are pressed and reduced to pulp.

Grinding of Rolls: The machining of press and calender roll surfaces to obtain the proper crown profile consistent with good operational performance.

Grit: (a) Hard particles in any component of the sheet furnish or coating colour or filler. In specifications for filler or coating pigments, grit is usually expressed as the percent remaining on a 325 mesh screen. (b) The abrasive particles in a pulpstone which are responsible for the grinding action of the stone. The size and shape

of these particles affect the quality of the mechanical wood pulp produced.

Grooved Roll Press: A paper machine wet press having a specially designed roll with circumferential grooves on the surface into which water is squeezed out by hydraulic pressure created at the nip, instead of the conventional section roll.

Grooved Table Rolls: Rolls located immediately after the breast roll or the forming board on the wet end of a paper machine. Such a roll consists of a steel tube covered by a thick rubber sleeve in which grooves have been cut to provide gentle drainage while a paper web is being formed on the wire running over it.

Gross Heating Value: A measure of the calorific content of any fuel, solid or liquid, to a furnace as determined in the laboratory with an oxygen bomb calorimeter.

Ground Water: A pulp and paper mill water supply obtained from deep wells and springs.

Groundwood Free: Containing no mechanical wood pulp. In practice, a paper found to contain less than 5 percent of mechanical pulp, by microscopic staining techniques, is considered groundwood free.

Groundwood Papers: Papers other than newsprint, made with substantial proportions of mechanical pulp, and used for printing or converting.

Groundwood Printing Papers: Low cost printing papers made primarily from mechanical pulps. Such papers are characterized by relatively high bulk-to-weight ratios, high opacity, and high speed printability. They are made in a wide range of grammage from 34 g/m² to 150 g/m².

Groundwood Pulp: A mechanical wood pulp produced by pressing debarked log against a pulpstone and reducing the wood to a mass of relatively short fibres.

Guar Gum: A polysaccharide, mainly mannogalactan derived from the seed endosperm of the guar plant grown in India and the United States and used as a beater or wetend additive primarily for improving strength properties. It may also be used as a surface sizing agent.

Guard Board: A scraping device placed on the upper couch roll or a paper machine to squeeze water of scrape off lumps of stock from the couch roll jacket.

Guide Roll: Any roll in papermaking machinery that can be adjusted to compensate for any misalignment of a paper or felt running over it.

Guide Sheet: The paper that is used to check and adjust automatic sheet guides on a paper machine.

Guillotine: A machine equipped with a long heavy removable knife for trimming paper with a downward slicing action.

Guillotine Cut: Paper cut or trimmed by means of a guillotine to give exactly parallel opposite edges.

Guillotine Dust: Loose particles separated in the process of guillotine cutting.

Guillotine Trimming: The operation of cutting away the edges of a pile of sheets with clean edges, exactness of angle and of a specific size.

Gum: (a) A substance of high molecular weight, usually with colloidal properties, which produces a gel, or viscous suspension or solution at low solids content in an appropriate solvent of swelling agent. (b) More commonly, a plant polysaccharide or derivative thereof, which is dispersible in water to produce a viscous mixture or solution, for example Guar gum, Karaya gum, Locust bean gum.

Gummed Cloth Tapes: Tapes, which may be clay filled, fibre filled, or cloth combined with paper, used by manufacturers of corrugated and solid fibre shipping containers for the corner stay (called manufacturer's joint). Generally one corner is taped.

Gummed Flat Papers: Strong, hard-sized, M.F. English, supercalendered or coated papers which have been gummed for use as gummed labels embossed seals, drug labels and other applications. They may be white, coloured, or metallic. Different gummings are required depending upon the surface to which the paper is to adhere.

Gummed Paper: Any paper coated on one side with adhesive gum, the adhesive being a dextrin, fish or animal glue, or resin, or a blend of any of these.

Gummed Reinforced Paper Tape: A tape made of two plain of kraft, reinforced with fibres or threads such as sisal, rayon, nylon, glass, combined with asphalt or other laminants and coated on one side with water-activated adhesive. It is commonly used to seal cartons.

Gummed Sealing Tape: A kraft paper which is coated on one side with a water-activated adhesive and slit to rolls in various widths and prescribed yardage. It is used largely for sealing packages, bundles and cartons. A certain amount of lightweight sealing tape is made from sulphite or kraft papers in white and various colours. This is used by retail stores where appearance is important.

Gummed Water-Resistant Tape: A gummed tape usually made from water-resistant, asphalt-laminated paper and a special adhesive which is activated by a solvent. This tape should have a water resistance or twenty four hours minimum. It is adapted for sealing frozen food package and also for export packaging.

Gumming: The operation of applying a gum or adhesive to a sheet of paper.

Gumming Paper: (a) For labels, a strong, hard-sized paper made of chemical pulp (usually bleached) in

rolls for gumming purposes. It may be white or coloured and should be free from lint.

Gun: A burner in a furnace which is used to introduce oil or gas fuel and air with the proper velocity, turbulence, and concentration to produce proper ignition and combustion of the fuel within the furnace.

Gymnosperms: Plants whose seeds are not enclosed in an ovary. The common trees of this type are cone bearing.

Gypsum: The hydrous form of calcium sulphate occurring in nature having the chemical formula of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. Sometimes this material is also referred to as pearl filler, puritan filler or terra alba. The pigment is used as a filler in paper, especially in building boards.

Gusset Envelope: That style of envelope which, in either pocket or banker shape, incorporates pleats to allow for expansion.

Gummed Paper Tape: Paper (usually kraft) coated on one side with glue, which becomes adhesive when moistened. It can be obtained in rolls of different widths.

Glue-End Carton: A carton which has its seam either glued or stitched, and which has at each end four square-cut or tapered flaps which are glued to effect the closure. It is also known as 'plain-end carton.'

Glazed Imitation Parchment: A strong glazed paper made from cellulose pulp. The term, particularly its abbreviation (GIP) is normally used for paper made from bleached pulp only.

H

H Factor: Integration of the relative rate of reaction over a period of time during the cooking cycle to obtain a single number that can be used to determine the degree of cooking that has taken place. In the case of batch-type digesters, it is sometimes used to determine when the cook is finished and the time to 'blow' the digester.

Hair Cut: A cut similar to a fibre cut caused by the pressure of a felt hair or human hair in the web.

Half-Fine Metallic Papers: Papers produced by laying patches of thin copper or aluminium alloys about five inches square, on an adhesive-coated sheet. The patches are applied to overlap both each other and the edges of the base sheet to form a continuous metallic surface. The extending patch edges are brushed free, forming clean straight edges.

Half Plate Paper: A machine-made paper of fine and soft texture used for woodcuts.

Half Stuff: Fibrous cellulosic material of natural vegetable origin, like hemp, rags, etc, after cooking, washing, defibring and bleaching into pulp ready to be

charged into the beater. After beating it is called whole stuff or simply stuff.

Halftone Blotting Paper: A blotting paper which has been subjected to a smoothing treatment on one or both surfaces in order that it will print readily without disturbing the surface fibres. It retains its blotting characteristics while at the same time it acquires some of the properties of a printing paper. It is primarily a blotting paper with a smoothed surface that is suitable for printing from coarse deep-etched halftones.

Halftone Paper: A printing paper characterized by a high finish, and suitable for halftone printing.

Hammermills: Types of high-speed equipment that use pivoted or fixed hammers or cutters to crush, grind, chip or shred solid materials prior to their being used in a process.

Hand Control: See 'Manual Control'.

Hand Valve: Type of flow control valve in process lines that is manually opened, closed or adjusted by a direct connected wheel.

Hand Work: Any manual operation performed with the use of hand tools as in the manufacture of paper boxes.

Handbill Paper: Any paper used for printing advertisements to be handed out to the public.

Handkerchief Tissue: A class of soft absorbent paper used for removal of cream, oil, etc, from skin and also for making paper towels, industrial wipes and for hospital use. It is made of bleached pulp and usually creped. It is characterized by softness and is also called facial tissue.

Handle: The impressions of touch and sound received when a sheet of paper is handled. Handle includes such properties as feel and rattle.

Handmade Felt: A press felt which is so made that it gives to the paper the surface appearance of a handmade paper.

Handmade Paper: Paper made by hand moulds in single sheets, having rough or deckle edges on four sides. The mould of the required size is dipped into a vat containing the stock and is lifted with a particular motion, forming the sheet. It is sometimes called deckle edged paper.

Hands: Members of the paper machine operating crew.

Handsheets: A sheet made from a suspension of fibres in water, with or without the addition of sizing, loading, or colouring agents, in an operation whereby each sheet is formed separately by draining the pulp suspension on a stationary sheet mould. It is generally used for testing the physical properties of the pulp or its combinations with other materials.

Hanging Paper: The raw stock used in the manufacture of wall-paper. The converter usually clay

coats the sheet and then prints it or in the heavier weights, embosses it. It is usually manufactured with a substantial portion of mechanical wood pulp, the balance being unbleached or bleached chemical pulp. However, some grades contain no mechanical pulp. The sheet is hard sized, has a toothy surface to enable the coating colour to adhere to the sheet, is uniform in surface so that the design will print uniformly and is especially adapted to hold deep embossing.

Hard Beating: A term applied to pulp which must be given a long treatment in a beater or refiner to develop the required paper-making properties.

Hard Bleaching Pulp: Unbleached pulp having a high 'K' or 'Kappa' number indicating that it contains a higher-than-normal amount of lignin and other noncellulosic material, thus requiring a greater amount of chemicals to bleach it to a comparable brightness value.

Hard Cook: A cook in which, intentionally or otherwise, there has been limited removal of noncellulose constituents. Sometimes called a raw cook, produces a hard pulp.

Hard Copy: A computer-produced printed document such as a typed printout paper tape, punched cards, or a videocopy,

Hard Fibre: A general term used to include stiff boards of a dense nature.

Hard Fold: A method of preparing large sheets of paper for shipment, which consists of folding a comparatively small number of sheets by hand and then compressing the fold by means of a round stick. Upon opening the paper, a definite crease remains.

Hard Gate: A flow control device used on sources of water-to-water turbine generators in hydroelectric plants and to water-powered wheel-driving mechanisms.

Hard Paper: (a) Usually a kraft paper, although other stocks may be used, which is impregnated with synthetic thermosetting resins. It is used in the form of plates, pipes, and moulded pieces for electrical insulating purposes. (b) A paper with a hard, smooth surface, mostly writing paper, which because of its sizing, is harder to print than ordinary book paper.

Hard Pulp: Pulp resulting from a hard cook, that is one which is mildly cooked or undercooked. Such pulps generally fall in the category of pulps having Kappa No. 35 and above and they are difficult to bleach.

Hard Sized: Paper sized to give a high degree of water resistance and surface spreading of aqueous inks or other aqueous liquids.

Hard Sized Book Paper: A book paper which has been hard sized for special purposes. The term applies only to the sizing characteristics of the paper.

Hard Stock: A term applied to pulps produced from rags, hemp or jute.

Hard Waste Cuttings: See 'Shavings'.

Hard Water: Types of mill source water that contains dissolved calcium, iron, aluminium, magnesium and other similar minerals generally related to its capacity to precipitate soap.

Hard White Shavings: See Shavings.

Hardboard: A board manufactured primarily from interfelted ligno-cellulosic fibres which are consolidated under heat and pressure in a hot-pressed to a density of 0.5 g/m^3 (31 pounds per cubic foot) or greater. Other materials may be added to improve certain properties, such as stiffness, hardness, finishing properties, resistance to abrasion, and moisture, as well as to increase strength, durability and utility.

Hardness: (a) That property of a sheet which resists indentation by objects of specified size, shape and hardness. Other definitions of hardness might be deduced from subjective judgement of hardness in handling and in use for example a paper which is stiff one which produces a strong rattle or one which feels hard when crumpled in the hand may be thought of as being hard. (b) When applied to pulp, a term usually referring to the degree of cooking, a hard pulp resulting from milder than normal digesting condition. (c) Applicable to rubber covered rolls used on paper machines, where specified levels of hardness are required for different locations.

Hardware: The actual physical, mechanical and electrical equipment that makes up the process measurement, control, and management systems in a mill, or to a computer system in general.

Hardwood: Wood obtained from a class of trees known as Angiosperms, which have short fibres. These trees are characterized by broad leaves and are usually deciduous. Such woods mostly occur in temperate and hot climatic regions. Example are Boswellia Serratta, Acacia, Eucalyptus, Maligin Arborrea, Silver Oak, Stapoplar, etc.

Hardwood Pulp: Any pulp made from a hardwood or mixture of hardwoods by either a chemical or a mechanical process.

Harper Machine: A type of fourdrinier machine in which the machine wire travels away from the presses, the flow box being placed between the breast roll and the first press, and the wet sheet being couched from the wire by a pickup felt and carried back above the wire to the first press. It is generally used in the manufacture of lightweight papers.

Hatch: A cover used to provide access from the top of storage bins or towers.

Haul: The distance that pulpwood must be transported by log trucks from the loading point in the woodlands

to the unloading point at the mill site, or the act of accomplishing this.

Haying: A paper mill expression referring to the process of making and gathering paper (broke) produced during a break in the sheet of paper on the paper machine.

Hazardous Air Pollutant: According to law, a pollutant to which no ambient air quality standard is applicable and that may cause or contribute to an increase in mortality or in serious illness. For example Asbestos, Beryllium and mercury have been declared hazardous air pollutants.

Head Loss: The decrease in pressure as a fluid flows through a pipe-line and across fittings in a pipeline.

Headbox: (a) On fourdrinier machines: A large flow control chamber which receives the dilute paper stock or furnish from the stock preparation system and by means of baffles and other flow evening devices, maintains sufficient agitation of the mixture to prevent flocculation of the fibres, spreads the flow evenly to the full width of the paper machine and provides delivery of stock to the fourdrinier wire uniformly across its full width. The height of the liquid in an open headbox or the air pressure in a closed headbox provide the requisite speed of flow of the stock onto the fourdrinier wire. The present design trend for high-speed machines is to enclose headboxes. (b) On cylinder machines: A flow-regulating device which controls the volume of stock flowing to the screens and mixing boxes before the vats.

Header: A common process pipeline or vessel from which a number of smaller branch lines are fed. It is used to carry fluid from a common source to various points of use.

Heads: The vapour portion of long tube-type black liquor evaporators.

Hearth: The bottom of a black liquor recovery furnace where the dried black liquor burns and forms a molten mass called smelt. The burner is known as a hearth burner.

Heat Ageing: Accelerating the aging of pulp by heating it in an oven at 105°C from 1 to 18 hours. It is performed in a laboratory to test the colour reversion properties by determining the degree of yellowing.

Heat Balance: The comparison of the heat input to the heat output around a process, process equipment, or furnace on a fixed time interval basis.

Heat Capacity: The energy needed to increase a unit mass on a material by 1°C at a constant pressure or volume.

Heat Exchanger: An enclosed tube-filled chamber in which a flowing medium in or around the tubes is heated or cooled by another medium in or around the tubes, without allowing the medium to mix.

Heat Extraction: The reduction of pressure and temperature of superheated steam from recovery and power boiler as it is passed through turbogenerators down to valves so that it can be used directly in the pulp and papermaking unit processes (such as digesters, evaporators, and paper machine dryers).

Heat Input: The total of the gross heat inputs of all streams having any fuel value, the sensible heats of material streams and air or other heat credits going to a power or recovery furnace.

Heat of Combustion: The amount of heat released per unit quantity of material (waste, liquor or fuel) burned.

Heat of Condensation: Heat given up when vapours such as steam condense and become available as heat energy. It is commonly used in multiple-effect black liquor evaporators. Also referred to as latent heat of vaporization.

Heat of Reaction: The heat produced or absorbed during chemical reaction. It occurs in unit processes such as the cooking of chips and the bleaching of pulp.

Heat Output: The total heat content of all output streams from a power or recovery boiler, including the heat transferred from the fire side to the steam side, sensible heat and latent heats of flue gas and smelt, heat reduction of makeup salt cake, additional gases, etc.

Heat Recovery: The process of extracting heat from flash steam or any other steam which would escape to the atmosphere, usually by having it heat fresh water which is used back in the process for pulp washing or dilution purposes.

Heat Release Rate: The quantity of heat (kcal) per hour per cubic meter of the internal volume of the furnace in which a material is completely burned.

Heat Seal Temperature: Dry adhesive activation temperature at which it will bond two surface, such as paper and paperboard, with proper pressure over a prescribed length of time.

Heat Sealing Paper: Any paper the surface of which has been coated so that it becomes adhesive when heated: (a) Heat-sealing or self sealing paraffin-waxed paper is bread wrapping or other grades having enough surface wax to permit sealing so that the wrapper is effectively held together and sealed against moisture loss or regain. (b) Heat-sealing grades of varnished or lacquered papers contain resins or other thermo-adhesive material.

Heat Transfer: The flow of heat from a warm area to a cooler one by conduction, convection or radiation, such as the transfer of heat from one fluid or material to another fluid or material, usually through a metal wall. In the paper manufacturing process it is common in evaporators, heaters, and condensers, in which the heating medium is usually steam but can be water or other materials.

Heat Up Time: The time required to heat up cooking liquor and chip mixtures to cooking or 'hold' temperature in chemical pulping performed in a batch-type digester. It also applies to other batch-type heating operations performed in a pulp mill.

Heavy (Wet) Crepe: A creped web or sheet of closed formation, made of cellulosic fibres and comprising one or more plies of paper. Creping is generally carried out before the paper is fully dried.

Heavy Black Liquor: Spent cooking liquor which has been evaporated down to a high solids content of about 50 percent or more. The term is generally used when referring to the black liquor after the evaporators and up to feeding the black liquor to the recovery furnace.

Heavy Spar: See 'Baryta'.

Heavy Weights: (a) Papers made in weights above the middle range basis weight which are usual for the grade. (b) In cover paper, the term may refer to the double thick or pasted weights.

Helio Type: See 'Collotype Printing'.

Heliograph Paper: A photographic printing paper developed by exposure to sunlight.

Helper Drive: A mechanical drive located anywhere on a paper machine or as an extension of sectional or lineshaft drives. It is used wherever slippage or undue strain is placed on a felt or wire, or where it is inconvenient to drive a roll with direct mechanical power.

Hemicellulose: The alkali-soluble, noncellulosic polysaccharide portion of cell wall of fibrous raw-material. It is an important constituent for paper making, as it helps in fibre bonding and strength of paper.

Hemp: (*Cannabis sativa*) A plant grown in nearly all the temperate countries of the world. It furnishes, a best fibre, obtained by a retting process which is used for making high strength papers like security papers. The term hemp has also come to be used in a generic sense as fibre and is then preceded by an adjective for example: Manila hemp, Sisal hemp.

Herbarium Paper: A lightweight bristol or cardboard usually cut 30 cm × 40 cm (11.5" × 16") on which pressed plants are mounted.

HI-LO Pulper: A type of pulper distinguished by having two individually motor-driven, side-mounted rotors with one driven at high speed for rapid defibring of pulp and the other driven at slow speed for circulating the slurry.

Hicky: See 'Persuader'.

Hideout: Silica in boiler water that has precipitated in inaccessible areas of a boiler and become mechanically loosened to cause a sudden increase in concentration.

High Bulk Book Paper: A book paper which under 35 pounds pressure, bulks from 440 to 344 pages to

one inch for a basis weight of 45 pounds (25 × 38-500). Other weight are in proportion.

High Consistency: Once used as a reference to any pulp slurry with a consistency of 6 percent or more. But with the trend toward processing in the higher consistency ranges, the reference value is now generally in the 10 to 16 percent range or higher, depending on the process.

High Consistency Refining: The mechanical treatment of pulp at consistencies of up to 20 to 30 percent sometimes performed on mechanical pulp screen rejects.

High Density Pump: Pumps designed especially for use on high consistency pulp slurries.

High Density Storage: The storage of pulp slurries in a high consistency condition, usually after the bleaching process and just prior to the stock preparation.

High Free-Rosin: Rosin size emulsions used in papermaking having a 30 to 40 percent free-rosin content.

High-Heat Washing: The countercurrent washing of pulp with weak black liquor while still in the lower part of a continuous digester.

High Pressure Feeder: A special valving device designed to feed materials such as chips or pulp, in a pressurized vessel in such a way that a seal is maintained without a loss in pressure.

High Pressure Interlock: Pressure-sensing device used to close gas header, fuel oil, and ignitor valves when the furnace pressure exceeds a safe value.

High Temperature Bleaching: Operating the bleaching stages (hypochlorite or chlorine dioxide) of a multistage pulp bleaching system at temperatures higher than considered conventional.

High Temperature Chlorination: Operating the first bleaching stage (chlorination) of a multistage pulp bleaching process at higher temperatures (usually 43°C to 49°C than considered conventional (less than 27°C).

High Velocity Convection Drum Drier: A machine used for drying coated paper consisting of a large drum enclosed by an evaporating hood.

High Yield: Descriptive reference to processes in which the yield is higher than the conventional yield, such as in pulping and bleaching under controlled conditions to minimize lignin and hemicellulose removal.

Hog Fuel: Raw bark wood waste, and other extraneous material which are pulverized and used as a fuel for power boilers in a mill.

Hoist: Types of lifting devices that mechanically elevated material by the use of a chain, cable rope, etc.

It usually consists of a block and tackle with multiple sheaves.

Holdout: The extent to which a paper or board surface resists penetration by aqueous or non-aqueous fluids. Where the fluid involved is water or water vapour this property is usually termed sizing. Non-aqueous fluids of concern include printing inks, lacquers, and various oils waxes.

Hole: An opening in a paper sheet, caused by slime, stock lump, coating splash, or other causes.

Holley Rolls: Hollow shell rolls, perforated with a regular pattern of holes, mounted on stub axles and located in the approach flow of stock to the slice of a paper machine headbox. It is used to stabilize and condition the stock.

Hollander: The original name given to the Beater. Generally a Hollander is used for mixing a pulp stock in batches with bleach liquor, etc. It is not used for cutting or refining of fibres. Since a beater is of hollander shape, old type beaters are sometimes called Hollanders.

Hood: (a) A canopy located over process machinery, such as paper machine dryers and pulp washers, to collect and carry away vapours by evaporation from the process. (b) The front or firing end area of a lime kiln.

Hopper: A funnel-shape chute or receptacle with an open bottom. It is used to add material such as chips, coal, etc, into digesters, furnaces, etc. It is also used to receive ashes being discharges from furnaces.

Horizontal Belt Washer: A type of brown stock washer designed to use, and whose operation is based, on a moving horizontal wire belt.

Horizontal Centrifugal Screens: Types of screens used for groundwood screening in which the stock is forced to spin around the inside of a horizontal screen drum and propelled from one end to the other by a winged rotor. The good fibres pass through the holes while the rejects move toward an exit out of the opposite end.

Horizontal Chests: Pulp stock storage tanks, usually of comparatively low height, in which uniform mixing and suspension are maintained by moving the slurry longitudinally by the use of midfeathers fitted with strategically located propellers, depending on the size and shape of the tank.

Horizontal Size Press: Type of size press in which the rolls are arranged next to each other in the horizontal plane, and the paper sheet to the sized runs vertically between them.

Horizontal Splitter: A log cutting machine, used in the wood preparation area of pulp mills, in which large diameter logs are placed in a horizontal position to be split into smaller sized so that they will slide through

chipper chute openings and better fit pulpwood grinder pockets.

Horsepower (hp): The unit rate of doing work. For instance, 1 horse power is equal to 33 000 ft/lb per minute or 42.44 Btu per minute. Electrically, 1 horsepower is equal to 746 watts.

Horsepower-Day per Ton: The specific energy consumption used as a basis of control for a grinder, refiner, or similar equipment. It is calculated from the average driving motor load in horsepower divided by the average oven dry production or throughout of oven-dry pulp in tons per day.

Hose End Valves: Water service valves that have fittings for hose connections.

Hosiery Insert Paper: A paper used as an insert in packaging women's hose. It is normally made with a high short fibre pulp content on a fourdrinier machine. The chief requirements are stiffness and bulk to keep the hose in place and a surface sufficiently smooth to avoid causing snage in the hose.

Hosiery Paper: Wrapping or tissue paper used in connection with the packaging of hosiery.

Hot Alkaline Extraction: The treatment of pulp as a stage during the bleaching process with caustic solution at elevated temperature.

Hot Blow: Discharging cooked pulp slurry from a continuous digester into the blow tank without cooling with black liquor.

Hot Embossing: The operation of embossing with heated rolls or plates.

Hot Grinding: A method of preparing mechanical pulp in which the volume of cooling water used is so regulated that the temperature of the pulp in the grinder pits is from 54°C to 88°C.

Hot Melt Coating: A method of applying molten wax on plastic materials to a base stock without solvent or other carrier, using a roll, knife, casting, or extraction method. This process usually gives high gloss and is frequently employed for the application of barrier materials to paper and board.

Hot Pressed: Originally applied to a process of applying pressure and heat to paper; now applied to paper which have been finished by plate glazing.

Hot Rolling: Glazing by means of steam-heated cylinders (calenders or supercalenders).

Hot Stock Screening: High temperature screening of pulp between the blow tank and the brown stock washers in a pulp mill with the use of pressure-type rotary screens.

Hotwell: A chamber at the bottom of a condenser where the warm condensate can collect prior to being pumped back into the process. Such as in a black liquor evaporators and power and recovery boilers.

Housekeeping: A common expression used around a mill that refers to the maintenance of clean, neat, and orderly conditions in and around the process areas.

Housing: The outer shell of a pump which encloses the impeller. Also referred to as a casing.

Hue: The attribute of colours which permits them to be classed as reddish, greenish, bluish, yellowish, purplish, etc. *See Colour.*

Hull Fibre: (a) The pulp obtained upon digesting the hulls of cotton seeds after they have been crushed. (b) A fibre such as that from coconut.

Humidifier: (a) A device to add moisture to paper in webs or sheets. (b) A device to add moisture to a room.

Humidity: The amount of moisture in a gas or gases, whether isolated or as part of the atmosphere, and expressed in absolute to relative terms. In and around the mill, it is generally considered as the water vapour content of the air.

Hydrated Stock: Pulp slurry subjected to prolonged mechanical treatment unit becomes partly gelatinized. It imparts a greasy feel which is evident on the grease-proof and glassine paper made from it. *See Hydration.*

Hydration: (a) In the physical sense, the condition of materials containing water of adsorption or imbibition. (b) In paper-making, the treatments, essentially mechanical refining which increases the amount of water held by the fibres. Increased hydration results in slower drainage rate and rather profoundly influences sheet properties, especially increased physical strength and decreased opacity. (c) The pulp characteristics resulting from the above treatment.

Hydraulic Barker: Type of pulpwood bark removal machine that utilizes high pressure water jets (at a suitable angle) to separate bark from logs.

Hydraulic Cooking: Cooking fibrous materials in a pressurised digester which has no vapour space, such as in continuous digesters, when the chip mass moves through in plug form.

Hydraulic Cylinder Operator: A cylinder used to provide mechanical motion by use of water or other liquid power.

Hydraulic Headbox: Type of paper machine pulp stock feeding chamber which operates completely full without any air pad.

Hydraulic Pressing: The removal of water from pulp laps from wet machines by the use of a hydraulically operated press, which is common in groundwood stock preparation.

Hydraulic Pressure: The force created by the compression of a liquid in a closed structure which may be transmitted to a moving component in the compartment.

Hydrocelluloses: Water insoluble products of the hydrolysis of cellulose with acids. They are molecularly heterogeneous in the sense that they are composed of molecules varying in degree of polymerization. The average degree of polymerization (DP) and the DP distribution depend on the nature of the acid treatment and on the original cellulose. The term may also be applied to any insoluble polysaccharide so formed and separated as a more or less homogeneous fraction from the mixture of products, but the singular form 'hydrocellulose' should not be used without an article, to avoid the implication of a molecularly homogeneous species.

Hydrodynamic Lubrication: A lubrication phenomenon occurring between a pulpwood grindstone surface and the wood logs under proper pressure during the wood grinding operation.

Hydrafoils: Deflector-type devices located under and in contact with the front portion of a paper machine wire, whose purpose is to increase water removal rates and increase the retention of fines in the web.

Hydrogen Bond: Interfibre cohesion in a sheet of paper that is attributed to the hydroxyl groups of the carbohydrates sharing a hydrogen atom in adjacent fibres.

Hydrogen-ion Concentration: The concentration of hydrogen ion (H^+) in an aqueous solution. It is a measure of the active acidity or alkalinity, and is expressed as the number of moles (1.007 8 gram) of H^+ per liter of solution. It may also be expressed in terms of pH.

Hydrogen Peroxide: A chemical (H_2O_2) with oxidizing (Reducing) properties used to bleach pulp sometimes alone but frequently as one of a group of pulp bleaching agents.

Hydrolysis: The absorption of water by a chemical compound causing it to form a new compound or compounds.

Hydrophilic: The physical property of substances that gives them a strong affinity for water. Also referred to be as easily wetted.

Hydrophobic: The physical property of substances that make them strongly repellent of water and said to be 'not' easily wetted.

Hydropower: Power or electricity produced by generators operated by water turbines, water wheels, or other water-actuated devices.

Hydrotropic Pulping: A pulping process in which the cellulosic raw material is digested with an aqueous solution of a hydrotropic substance, that is one which has the property of markedly increasing the solubility of materials which ordinarily are but slightly soluble in water, for example sodium m-xylene sulphonate for the removal of lignin.

Hygro-Stability: Ability of a paper or board to retain its dimensions or shape despite changes in its moisture content.

Hygroexpansivity: The change in dimension of paper that results from a change in the ambient relative humidity. It is commonly expressed as a percentage and is usually several times higher for the cross direction than for the machine direction. This property is of great importance in applications where the dimensions of paper sheets and cards or construction board are critical.

Hyperfiltration: A filtration system in which pulp mill spent liquor effluents are passed, under pressure produced by a pump, between semipermeable membranes which retain polluting, toxic, and coloured substances, and molecularly separate useful products such as lignins, wood sugars, etc.

Hysteresis: Difference in the value of a property of a substance depending on whether a given value of a related condition or variable is approached from a higher or lower level. For example paper conditioned at 50 percent relative humidity will have a greater moisture content when this environment is approached from a higher relative humidity than from a lower relative humidity. Hence the return of a function to its origin through a different path is called Hysteresis.

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Ice-Cream Board: A paper board used for packaging ice cream. It is made of chemical pulp, commonly from 0.4 to 0.55 mm (0.010 to 0.022 of an inch) in thickness. It is subsequently waxed, coated or otherwise treated resulting in a clean moisture-resistant board.

Ice-Cream Brick Wrapper: A waxed paper or vegetable parchment sheet used for wrapping ice-cream bricks.

Ice Paper: A well sized paper which is coated with dextrin, gum arabic or other adhesive and a salt, such as zinc sulphate, barium chloride or sodium acetate, which forms crystals upon drying and this gives the paper a frosted appearance.

Ideal Pigment: Plastic papermaking/coating pigment that would meet certain criteria, consisting of low specific gravity, high brightness, high refractive index, controlled particle size, easily dispersible, chemically inert, compatible with other pigments, nonabrasive, low adhesive demand, controlled oil absorption, low price and high performance efficiency.

Ignitor: A supervised burner in a power or recovery furnace which is spark ignited. In continuously supplies enough energy to sustain stable operation of other burners or a hearth no matter that lighting off or firing conditions exist.

IGT Tester: It is developed by Institute of Graphic Technology, USA. An instrument used to determine characteristics of paper and paper board for its printing qualities like fibre picking, ink absorption, ink spreading, etc. by simulating the printing press characteristics under specific standard conditions.

Illustrated Letter Paper: A bond paper so treated, as by coating on one side as to make it suitable for fine illustrations on the one side and for ordinary typewriting or writing on the other side.

Illustration Board: A pasted board used principally for ink and water colour. A typical drawing paper is pasted on both sides of the board (usually a filled pulp-lined board or a pasted board). Usually properties of drawing paper, such as finish and sizing, are essential but hard sizing and good erasing qualities are most important. The finished board should be as free as possible from warping.

Imbued Water: The water that cellulose fibres will absorb on immersion after they have taken up all of the moisture they can form being exposed to saturated water vapour.

Imitation Art Paper: Highly finished printing paper prepared by the addition of a high percentage of china clay to the pulp. It has a water finish, giving it a surface, opacity, and absorbancy suitable for printing halftones. The distinction between art paper and imitation art paper is that in the former the clay is coated on the surface whereas in the latter it is mixed with the fibre.

Imitation Drawing Paper: Strong paper of varied qualities and surfaces, used for drawing or printing with water colours and capable of withstanding hard erasers.

Imitation Deckle Edge: See Deckle Edge.

Imitation Glassine: Heavily sized paper made from bleached sulphate or sulphite pulp. It possesses resistance to moisture and penetration but has only slight grease resisting qualities.

Imitation Greaseproof Paper: A term applied to a heavily sized paper made from well-beaten bleached or unbleached chemical pulp. This paper possesses some resistance to moisture and blood penetration but has less grease-resisting qualities than greaseproof paper.

Such papers do not respond to Blister test (See Grease proof paper).

Imitation Japanese Paper: A paper made of hemp fibres to imitate in strength and appearance Japanese vellum. It is used for insulating purpose in armatures.

Imitation Kraft Paper: A paper sometimes used as a substitute for kraft paper where strength and durability are not necessary. It is commonly made of mechanical pulp, unbleached sulphite, or from waste papers and is coloured brown to give to appearance of kraft.

Imitation Parchment: A single-process all chemical pulp sheet, originally so called to designate it as an

imitation of vegetable parchment (but not an imitation of animal parchment). It now bears practically no resemblance to vegetable parchment paper, nor does it possess any of the qualities of that sheet. At present the term is used to describe a superior quality writing paper made of bleached chemical pulps with dense and slightly translucent finish.

Imitation Press Board: A heavily calendered, cylinder machine board made of chemical and mechanical pulp and used for note-book covers, etc. It is usually paste laminated into thick boards. It simulates Transformed Board but lacks its high density and dielectric characteristics. It is made in a variety of colours and has characteristic mottled surface.

Impedance: The opposition to the flow of electricity in an alternating current (AC) electrical circuit.

Impeller: (a) The rotating member of a pump or blower which moves the flowing material. (b) A fan-like propeller installed in baffled walls of stock storage tanks to maintain movement and suspension of slurries.

Impervious: Resistant to the penetration of moisture, grease, oil or chemicals.

Impingement Air Drying: The drying of paper by use of high velocity and high temperature air jets perpendicularly directed to the surface of the wet sheet.

Impingement Scrubber: A type of flue gas scrubber normally used in lime kiln operations. It consists of a vertical tower equipped with perforated horizontal plates having holes with baffles located over them through which gases pass and impinges as they are subjected to a liquid cleaning process.

Impregnated Paper or Board: Paper or board into which a suitable product has been impregnated to impart any desired special property.

Impregnation: (a) The process of treating a sheet or web of paper or paperboard with a liquid. This may be a molten material such as hot asphalt or wax, a solution of some material in a volatile solvent, or a liquid such as an oil. Pressure may or may not be used in the operation. (b) A term used to describe a treatment in which fibrous raw material are infused with a chemical solution prior to a digesting or fibreizing process. Sometimes called preimpregnation.

Impress: The different hand and mechanical methods of applying reading meter, illustrations, decorations, or ruling to paper.

Impression: (a) The compression of paper and backing materials needed to transfer ink from one surface to another, as plate to paper, plate to blanket, or blanket to paper, usually expressed as thousandths of an inch beyond that needed to produce first contact between two printing cylinders. (b) A printed copy.

Impulse: The product of the average force and the time during which it acts. This product is equal to the change in momentum produced by the force.

Impulse Drying: A method for rapid drying of paper using a simultaneous mix of pressing and drying processes, usually involving high nip loading (dryer drum nips with a special roll).

Impulse Pressing: Use of a press section with special covered rolls that flatten and extend the nip under high fly-loadings, thus improving press efficiency.

Impulse to Rupture: A test employed in evaluating the strength of paper. It is expressed as the integrated product of the force (to cause rupture) and the time interval over which the force acts on the specimen.

Impurities-Waste Paper Contraries: Any material in waste paper or board that might be detrimental to the paper or board being manufactured from the waste paper or board or which might damage papermaking equipment or render repulping difficult.

In-crown: The crown profile of a paper machine roll before being run on the machine.

In the Flat: Paper or board supplied in sheet not folded, as distinct from reels. Also called 'Flat'.

Inching: Moving sections or the wire of a paper machine at very low speed, usually with a small AC high torque gear motor, large enough to overcome static friction breakaway from the rest position. It facilitates inspection, changing of felts, startup, and clearing the cylinder of broke after a machine break. Sometimes known as jogging.

Incineration: The controlled consumption by burning of solid, liquid or gaseous material or fuels in a power or chemical recovery furnace.

Inclined Screw Washer: A type of washer used on de-inked stock after cleaning and screening to remove the dispersed inks, clays, and chemicals. It consists essentially of an inlet section supplying a number of inclined screws. The stock is pushed upward through a common perforated cylinder as the screws rotate. Water drains through the perforations as the stock is pushed out of the port in the upper end.

Inclined Tube Digester: A type of continuous digester whose main vessel consists of a tubular chamber mounted at an angle and usually fitted with an internal chip-moving mechanism, such as a drag conveyor, to move the chips being cooked down and up the digester.

Inclined Wire Save-Alls: Devices used to reclaim fibres and fillers from paper machine white or filtrate water by the use of an inclined screen of fine mesh wire over which the water is allowed to flow.

Indented: A term used to indicate a paper or paper-board with raised knobs developed or formed into the sheet in the primary process. It is produced with large

or small indentations or knobs without puncturing the sheet producing a soft, bulky sheet of paper. Such material is especially suitable for packing or wrapping purposes when it is desired to prevent jarring of the articles so treated.

Index Board: A general term applied to various types of boards used principally for index records.

Index Bristols: A class of heavyweight papers used for index cards, and the like. They are usually made from strong chemical pulps in solid or two-ply pasted form, in white or colour. It may/may not contain rag fibres.

Index Card: A sheet of board or rigid paper of appropriate quality used for recording data in filing systems.

Index Press Board: A general term applied to those boards used for the manufacture of filling materials-guides, folders, etc, and for book covers, such as composition books, receipt books, etc. This class may be divided into genuine and imitation pressboards, the difference between the two being in the density, rigidity, and finish. The furnish is generally chemical pulp, although some grades may contain a small percentage of rags. For the most part, they are made on a cylinder machine, although some are made by the so-called wet process. Genuine pressboard is finished by means of a glaze roll, which gives a high density and a highly polished surface. Imitation pressboard is finished by means of calender rolls.

India Oxford Bible: See 'Bible Paper'.

India Paper: See 'Bible Paper' or 'China Paper'.

India Proof Paper: A paper of straw colour, extremely soft and absorbent unsized, which can readily conform to the surface pattern of a printing plate to absorb ink without smearing, thus giving a true proof impression. The term is also loosely used to include all illustrations printed on India paper.

India Tint: Light buff colour.

Indicating Gauge: An instrument on which a measured process variable is visually displayed.

Indirect Air Heater: A type of heat exchanger used on chemical recovery furnaces in which the combustion air is heated by passing hot gas in a countercurrent direction through the opposite end of a tubular chamber with no direct contact between the air and the hot gas.

Indirect Cooking Process: The process of chemically pulping chips with cooking liquor by steam in a heat exchanger. There is no direct contact between the cooking liquor and the steam.

Indirect Heated Digester: A batch digester that uses heat exchangers to heat the cooking liquor, usually with steam. The steam never comes into direct contact

with the liquor, which is circulated through the heater by a circulating pump external to the digester.

Induced Draft (ID) Fan: A fan located between a lime kiln, power furnace or chemical recovery furnace, and flue or stack to create a negative pressure (induced draft) that will pull excess air and combustion products out of the kiln and furnace.

Induction Motor: A motor in which the electrical energy delivered to a primary circuit is converted to mechanical energy by electromagnetic interaction between it and a closed secondary circuit.

Induction Voltage Regulator: A type of voltage regulator in which the positions of the primary and secondary windings can be adjusted by rotation.

Inductive Load: The type of load on an electrical system in which the current lags behind the voltage over the entire load.

Industrial Boiler: A boiler used primarily to generate steam for process requirements but may also be used to provide steam for turbine generator operation.

Industrial Papers: Papers intended for industrial uses, as opposed to those for cultural or sanitary purposes.

Industrial Power Boiler: A boiler used to produce energy primarily for use in an industrial plant.

Industrial Wastes: The liquid and solid wastes from industrial processes as distinct from domestic or sanitary sources.

Industrial Wipes: Paper towels that are especially made for industrial cleaning and wiping uses. Capacity to absorb oil and water, high-wet strength properties, lint freeness, and pliability are important characteristics. Some are single ply and others are made from two or more plies of a special facial-type stock.

Infiltration Air: Air that leaks into chambers and ducts of lime kilns and power and chemical recovery furnaces.

Influent: Mill wastes, water and other liquids, which can be raw or partially treated, flowing into a treatment plant, reservoir, basin, or holding pond.

Infrared Rays: Invisible light rays which are longer than red rays in the spectrum and have a thermal effect that has been utilized in the drying of paper and other materials. They represent 0.75 to 500 μm wavelengths of electromagnetic spectrum.

Infrared Spectroscopy: The science dealing with the spectral analysis of compounds using radiation in the infrared region (750 to 500 000 nm).

Infusorial Earth: See 'Diatomaceous Silica'.

Ingrain: A descriptive term for a mottled or granite appearance in paper.

Inhibitive Tissue: Generally a kraft interleaving tissue impregnated with sodium chromate to prevent water stains on flat sheets of aluminium.

Injection Cooking: Type of kraft cooking process which includes a continuous injection of white liquor during the cook to keep the alkali concentration at a constant level.

Ink-Jet Printing: A printing process in which tiny jets of ink controlled by electronic impulses from a computer form printed images on a moving web.

Ink Rub-off: The smudging and spreading of a print due to friction against paper, fingers, personal clothing, or any other surface. Ink-rub-off is particularly objectionable in newspapers which normally use inks with a mineral-oil base.

Ink Transfer: The amount of ink film transferred to a receiving surface as the result of printing impression, expresses as a percentage of ink available.

Inkometer: An instrument for measuring the tack of ink in terms of the force required to split an ink film between rollers with controlled speed, temperature, and ink-film thickness. See IGT Tester.

Inlet: The piping system located just prior to the paper machine head-box through which the paper stock furnish is fed and distributed to the headbox proper.

Input: (a) Any data or information furnished to a computer or instrumentation system for processing. (b) The devices that perform the operation in (a), above, (c) The material that go to a process to manufacture of product or an intermediate product.

Insect Repellent Paper: More properly an insect resistant paper. A paper which has been treated for protection against insect penetration. There are a variety of insecticides which can be applied to the paper but the most common group of chemicals are pyrethrine and piperonyl butoxide. These are frequently used in the manufacture of cartons or multiwall paper bags where protection is necessary against boring insects.

Insert: (a) A term applied to a single sheet of the same or different quality inserted in a magazine, newspaper, or book. When the insert is of better quality than the overall stock, as for instance when it is coated, it enhances the display features thereof. (b) A thin filler or frame of paperboard or wadding used to take up space or separate articles within a package. (c) A pad of the same material as the box which is dropped into the gap between the inner flaps when all flaps do not meet.

Instrument: A device that automatically measures indicates, or records and controls process variables.

Instrument Shop: An area or room in a pulp and paper mill where repairs on various types of instruments and automatic valves are carried out.

Instrumentation: A group of applied devices used to detect, measure, indicate, record, compute, and control manufacturing and process variables in a mill.

Insulating Board: A type of board composed of some fibrous material, such as wood or other vegetable fibre, sized throughout and felted or pressed together in such a way as to contain a large quantity of entrapped or 'dead' air. It is made either by cementing together several thin layers or forming a nonlaminated layer of the required thickness. It is used in plain or decorative finishes for interior walls and ceilings and also as a water-repellent finish for house sheathing. Desirable properties are: low thermal conductivity, moisture resistance, fire resistance, permanency, vermin and insect resistance, and structural strength. No single material combines all these properties but all should be permanent and should be treated to resist moisture absorption.

Insulating Materials: Insulating materials include the following classes:

Heat-insulating materials:

- Felt
- Refrigerator paper
- Floor felts
- Roofing felts
- Floor lining or deadening felts—Plain or indented.

Insulating crepe-wading blankets

Asbestos

Sheathing:

- Red, gray or blue rosin sheathing
- Paper-lined felted fibrous products

Structural fibre insulating board:

- Building board
- Lath (for plaster base)
- Roof-insulation board
- Interior boards (factory finished):

- Interior-finish board
- Panel board (or tile board)

Sheathing

Interior boards (flame-resistant-finished surface):

- Interior finish board
- Panel board (or tileboard)

Electrical insulation materials:

Untreated:

- Coil papers (those papers often described as layer insulation, used as insulation between wire layers and as wrap around insulation)
- Cable papers (or turn insulation-conductor wrap)
- Slot papers (slot and commutator segment insulation)
- Crepe papers (for forming purposes, taping or coils, leads and insulating pads)
- Capacitor tissue (capacitor dielectrics)

Electrolytic condenser paper (relatively porous paper used as a spacer between foils in electrolytic condensers)

Transformer board (sometimes called pressboard and used as layer insulation in transformers and as formed parts, separators, and mechanical supports in various electrical applications).

Treated:

Impregnated (with resins, varnishes, waxes, and dielectric liquids).

Coated (with resins, varnishes, waxes, etc).

Chemically or mechanically pretreated

Vulcanized fibre (a cotton paper treated with zinc chloride) in various grades called electrical insulation fibre, hard fibre, hermetic fibre, bone fibre.

Mechanically hydrated (paper prepared from pulp subjected to considerable mechanical hydration)

Sound-insulating materials

Acoustical board.

Insulating Paper or Board: Paper or board which is intended to impede the transmission of certain forms of energy, for example, heat, sound and electricity.

Insulating Tissue: Thin paper used for insulating radio wire, magnet wire transformer wire, telephone cable wire, and for use under the rubber in lamp-card wire. It is customarily made from manila fibre chemical pulp, or mixtures of the two and normally is fairly open porous, tough and long fibred.

Intaglio: (a) Engraving incised or cut into the surface of wood or metal as distinguished from engraving in relief. (b) A type of watermarking with a dandy roll. It is also called shadow watermark.

Intaglio Paper: Any paper suitable for intaglio printing.

Integral Control Action: A process control mode in which the output is proportional to the time integral input, or the rate of change of the output is proportional to the input. Also referred to as reset control action.

Integrated Pulp and Paper Mill: (A) A pulp and paper mill (manufacturing complex) in which all pulp and paper making operations are conducted at one site. Sometimes converting operations, such as bag and tissue manufacturing, are also included. (b) Paper and paper board mills that produce their pulp.

Integrated System: A system that links several process control system together so that they will operate as a unit.

Interface: (a) The place at which an operator and control system, an operator and process, a control system and process, or one control system and another control system meet and interact with each other. (b) The adhered surfaces which come into contact with the

adhesive or the area of contact between them when a multilayer sheet is made by gluing several or the sheets together.

Interfibre Bonding: The cohesion produced between fibres usually by mechanical treatment, which lends a toughness and other strength properties to the paper and paper board sheets produced from them. Also referred to as Internal Bond.

Interfolded Tissue: (a) Waxed tissue that has been folded and cut so that one sheet at a time dispenses from a carton. Used primarily for food handling in commercial food establishments. (b) Toilet tissue that has been folded and cut so that one sheet at a time dispenses from a specially mounted wall dispenser. (c) Facial tissue that has been folded and cut so that one sheet at a time dispenses from a carton.

Interior Packing: A term inclusive of pads, partitions, liners, etc., used inside a shipping container to separate or give added protection to the contents. It may be made of single-faced, double faced, or double wall corrugated board or solid fibreboard cut to sizes and shaped to specifications; or it may be Cellulose wadding or Indented board.

Interior Wraps: Materials used to protect individual items against penetration by water, other liquids, gases, and the like.

Interleaving Paper: (a) A paper (usually of tissue weight) which is placed in front of illustrations in books or between two or more engravings, etchings, sheets and cellulosic films, etc. (b) A paper which is inserted between sheets as they come off the printing press to prevent offset. (c) Thin blottings used in diaries. (d) A paper made from mechanical pulp which is used in the printing of textiles. Also *see* Flock Tissue.

Interlocking: The arrangement of equipment or devices so that they will operate only in a proper sequence of events within limit or off-limit conditions. They cause a starting or stopping of related operations and are commonly used in multistage pulp bleaching, paper machines, and chemical recovery and power boiler operations.

Intermittent Board Machine: A machine for producing thick sheets or board. It consists of either a Fourdrinier wire or one or more cylinder moulds or vats. The web on leaving either of the foregoing, is wound round a making roll to form a sheet consisting of several layers of which the thickness increases with the number of turns of the making roll. When the thickness is sufficient the layers are cut and the sheet so released is removed from the machine.

Internal Bond: The force with which fibres are bonded to each other within a sheet of paper or paperboard, *See* Inter-fibre bonding.

Internal Tearing Resistance: The force in milli Newtons required to tear a single sheet of paper after

the tear has been started. It should not be confused with initial tear or edge tear. It is normally tested on an Elmendorf tester.

Internal Thread: The screw thread located on the inner surface of a nut or any other screw type fitting.

Internal Treatment: The treatment of raw boiler feedwater by direct feeding of chemicals in order to precipitate impurities as a sludge rather than scale, to condition the sludge so that it will not stick (allowing it to be removed by blowdown) and to make it noncorrosive.

Intermittent: Refers to discontinuous or batch operations of unit processes in the mill during the manufacture of pulp and paper and include beater operation, cooking of fibrous materials, colour makeup and coating makeup.

Intrinsic Viscosity: An empirical test for evaluation the degree of degradation of cellulose. It is used as a control procedure in the manufacture of rayon and other cellulose-based products such as films, lacquers, and plastics. Technically, it is equal to the specific viscosity divided by the concentration (c) when the concentration approaches zero.

Inventory: A surplus of raw material, pulp, paper, or paperboard, spares, machinery parts and similar stores items of consumable and nonconsumable nature accumulated and stored for future needs and/or sales.

Inverform: A papermaking device used to manufacture single or multi-ply grades of paper and paperboard. The stock flows from a headbox to a bottom wire (similar to a fourdrinier) and is then joined by a top wire so that water removal from the stock is accomplished through the top wire as well as the bottom wire. In multi-ply operation the bottom wire and formed web continue under subsequent headboxes where additional plies are laid down. Each headbox is followed by another top wire. For each additional ply thus laid down virtually all of the water removal is upward through the top wire. The machine is capable of extremely high speeds of operation.

Inversion: An atmospheric condition where a layer of cool air is trapped by a layer of warm air so that it cannot rise. Inversions spread polluted air horizontally rather than vertically so that contamination substances cannot be widely dispersed. An inversion of several days can cause an air pollution episode.

Inward Flow Screens: Types of rotation, cylindrical screens used directly ahead of the paper machine to remove impurities from the stock by having them pass from the outside through screen type plates towards the centre and out the end while the tailing settle to the bottom and are drawn off.

Ion Exchange Paper: A paper having the property of selectively absorbing either positive or negative ions, and used for the separation of ions or for removal of

certain ions from solution. The paper may be made from modified cellulose fibres, from non-cellulose fibres having acidic or basic properties or as a sheet containing cellulose fibres and ion-exchange resins.

Iron Free Alum: A paper makers alum which is essentially free from iron as required in the sizing of photographic and other speciality papers. *See* 'Alum'.

Iron Specks: Fragments of iron or rust in the sheet.

Isobaric: A term used when referring to any process under constant pressure.

Isolating Valve: *See* 'Block Valve'.

Isotropic: A property which describes (mathematically) the constant portion of heat that is added to a process but cannot be converted to useful work.

Item: One grade of paper made in one size, weight, grain, finish and colour.

Ivory: A cream white colour.

Ivory Board: A coated board generally used for visiting cards, menu cards and similar products. The coating is applied to both sides. It is generally above 150 g/m² consisting of one or more plies (*see* 'Ply') may or may not have combined by pasting (*see* 'Pasting'); made wholly from bleached chemical pulp and suitable for printing and writing. It is characterized by its smoothness, stiffness, clean appearance and even look through.

Ivory Bristol: A heavy, uncoated smooth finished paper designed primarily for printing or engraving of business cards. It is usually made from chemical pulps. It may or may not contain rag fibres.

Ivory Ledger: A good quality strong white printing and writing paper used for making accounts books, diaries, records of long keeping nature. Mostly containing long fibre, cotton fibre in different proportions to impart better keeping properties and high strength.

J

Jack: A device used to lift weight or exert heavy forces in a pulp and/or paper mill. It is usually portable and manually operated, using the principle of a screw, lever, toggle joint, or hydraulic pressure.

Jackson Turbidity Unit (JTU): A measure of the turbidity of water which is proportional to the silicon content. It is expressed in parts per million (ppm).

Jacquard Board/Paper: A paper or Paperboard made from special kraft fibre stock (some grades use a percentage of new rags) suitable for cutting or perforating and specifically used on looms of jacquard machines. This grade has exceptional punching qualities as each card is perforated with a large number of holes. The card should also lie flat and show

minimum change in dimensions under extreme atmospheric conditions.

Japan Papers: A special type of paper with irregular formation, imitating the old imperial valium which gives the surfaces a beautiful mottled effect. Besides this surface effect, the papers are characteristically long fibred and strong. These papers are used for offset printing, novelties, greeting cards, and the like.

Japanese Copying Paper: Specially thin and strong papers made in Japan from long fibres, such as mitsumata and paper mulberry, and used for copying book. These papers are largely handmade, the fibres pulped by hand and the sheets made on molds of bamboo or hair. The length of the fibre gives a paper of exceptional wearing qualities, the fibres pulling apart and not tearing.

Japanese Vellum: A thick paper, made in Japan, of native fibres, which are characterised by their length. The formation is very cloudy and the paper is very tough and durable. The colour is usually a cream or natural colour. It is finished with a good surface and is suitable for certificates or for other purposes where a tough durable paper is necessary.

Jeelly Gums: Types of high-solid content adhesive coating used in making foil papers, laminates and automatic labeling paper.

Jet Condenser: Type of heat recovery system in which the steam flashed off the process equipment such as batch digester is recovered and utilized for heating wash water. It consists of a means of transferring heat from flow steam condensate to fresh water by use of a liquid-to-liquid or vapour-to-liquid heat exchanger.

Jet Cooker: A type of cooking device such as used on starch suspension in which a controlled flow of steam is admitted into a chamber, referred to as a jet, where it is mixed with a stream of starch slurry continuously fed through it under pressure by a pump.

Jet Deckle: A deckle edge made on the fourdrinier or cylinder wire by means of a jet of water or air.

Jet Dryer: Paper dryer that uses high velocity and high temperature air jets impinging directly on the wet sheet.

Jewellers Tissue: An antitarnish tissue used for wrapping silver and other articles. It is made from cotton fibre and/or chemical pulp. It is usually white in colour and is frequently fine ribbed.

Jib Cranes: Types of cranes used throughout a mill to move materials. They generally consist of a beam or beam that project from a supporting wall or post in such a way that they can be swung around in the vertical axis.

Job Lot: (a) Paper produced in excess of an order or small lots of discontinued lines. (b) Paper rejected because of defects or failure to conform to specifications, or paper which although of standard

quality at the time of manufacture, has become nonstandard because of a change in standards subsequent to manufacture.

Job: The mechanical or manual operation of producing a smooth-sided pile of paper by jarring the sheets against a smooth, flat surface.

Jogging: See 'Jog' and also 'Inching'.

Jordan: A refiner whose working elements consist of a conical plug rotating in a matching conical shell. The outside of the plug and the inside of the shell are furnished with knives or bars commonly called tackle. In operation the rotating conical plug is pushed into the shell to press against the shell knives or bars and gives a macerating action on the fibrous material in water suspension that is passed between them. Stock is usually introduced into the small end of the jordan and withdrawn from the large end though it may also be pumped through in the other direction.

Joule: It is an unit of work or energy (Mechanical or Electrical) done by one watt in one second. Mechanically it is the product of one Newton and one meter.

Journal: The part of a shaft or axle of a paper machine or any other rotating piece of machinery that rests on a bearing.

Jumbo Roll: Any large roll of paper. In most parts of the paper industry a jumbo roll is considered to be a roll having a diameter of more than 36 inches and a weight of more than 2 tonnes.

Jump Stage Countercurrent Washing: A countercurrent method of washing pulp during the bleaching process in which the filtrate from the latter bleaching stages is used serially for showers of the earlier bleaching stages, skipping over the extraction stages. This is useful in bleach plants that do not use stainless steel washers on their extraction stage to prevent corrosion.

Junk Remover: A device located on rag beaters, pulpers or their dump chests in order to remove large extraneous materials.

Jury Rig: A temporary or emergency repair job on a piece of process equipment.

Jute: (a) An Indian bast fibre, white jute (*Corchorus Capsularis*) and tossa jute (*C. Olitorius*) which is used for the manufacture of coarse sacking and bags (gunny sack). Old gunny and sacking are used as raw materials in papermaking. (b) A general term that now indicates a furnish consisting substantially of paper stock reclaimed from waste papers.

Jute Bag Paper: Bag paper made from jute fibre.

Jute Board: (a) A paperboard for use in shipping containers. (b) A combination board for use in folding box manufacture, made on a cylinder machine wherein one or both of the outer plies are made of kraft or

reclaimed kraft paper stock and the remainder of mixed paper stock. Although this is termed jute, it contains no jute fibre. The board must be able to withstand scoring and folding.

Jute Bristol: A bristol in which the furnish contains more than 50 percent of jute fibre. It is characterized by unusual strength, specially high tearing resistance and is used for various purposes where durability is essential.

Jute Envelope Paper: A strong, opaque paper with good folding qualities made of jute fibre along in combination with kraft, and used for envelopes. It may be machine or water finished.

Jute Linerboard: A paper board used chiefly as an outer facing in the manufacture of corrugated or solid fibre shipping containers. It is made primarily of paper stock reclaimed from old corrugated containers, shipping sacks, and the like with or without small additions of virgin kraft pulp. No jute fibre is employed in the furnish. It is usually formed on a multicylinder machine.

Jute Paper: Any paper made from jute fibre (*Corchorus Capsularis* and/or *C. Olitorius*) or burlap waste with various proportions of kraft or sulphite pulp. Jute papers are used extensively for envelopes, folders, tag stock, wrappers, cover stock, bristols, pattern papers, and a variety of specialties; also hydrated lime and cement bags, flour sacks, etc.

Jute Pulp: Jute pulp is made from reclaimed sacking, burlap, and string by cleaning, chemical cooking with lime or caustic soda, and bleaching paper of acceptable strength and durability is made from such pulp.

Juvenile Wood: Wood formed in the early years of tree growth characterized by shorter, weaker and less dense fibre as compared with the stronger denser wood laid down in the growth rings of later years.

K

K.B. Board: A paperboard made by a patented process and used for automobile panels and other purposes where waterproofing is an important factor. It is made on cylinder or vat machine with a furnish composed of waste-paper stock and an emulsion of asphalt about 15 to 20 percent in weight. The board is vat lined or subsequently lined with paper or pasted onto plain or embossed paperboard. It is stiff and waterproof.

K. Number: A value, also called permanganate number, which is the result of a laboratory test for indirectly indicating the lignin content, relative hardness and bleachability of pulps usually having lignin contents below 6 percent. It is the number of milliliters of tenth normal permanganate solution (0.1

KMnO₄) which is absorbed by 1 g of oven dry pulp under specified conditions.

Kamyr Digester: A type of continuous cooking system, characterized by tall, vertical, cylindrical cooking vessels. The chips or other materials to be cooked are fed into the top with the proper liquor make-up under pressure with a special rotary feeding device. The unit takes its name from its manufacturer, Kamyr Inc.

Kaolin: A whitish earthy material composed primarily of the clay mineral kaolinite, a form of aluminium silicate. In refined form, kaolin is used in paper making as filler, coating component and opacifying agent.

Kappa Number: It is determined by the number of millilitres of tenth normal permanganate solution (0.1 N KMnO₄) which is absorbed by 1 gram of oven dry pulp under specified conditions, and is then corrected to 50 percent consumption of permanganate. Kappa number indicates bleachability of a pulp and also if the pulp falls under category of bleaching grade, semichemical or mechanical grade.

Karaya Gum: An acetylated polysaccharide obtained from the dried exudation of the *Sterculia urens* tree grown in India. In the deacetylated form it is used as a fibre deflocculating agent for long-fibred pulps.

Kenaf: An annual plant (*Hibiscus cannabinus*) originally from the East Indies but now widespread of which the fibre can be used for paper pulp and for cordage.

Kettle: A process vessel heated by direct steam in a steam coil or a steam jacket. It is used frequently to made up materials like rosin size and other papermaking materials that require heat for cooking or processing.

Kid Finish: A vellum finish on a soft texture paper. It resembles in appearance and feel undressed kid leather. It is similar to a smooth eggshell finish, but it has a finer surface texture. It is used for bristlos, wedding and paperies.

Kiln: A furnace, either horizontally rotating or vertical stationary, used to burn lime stone for making lime or to reburn lime sludge from recovery plants to regenerate CaO. It consists of an inclined open-ended cylinder, made of steel and refractory lined. The lime travels from the higher feed end to the lower discharge end (as it is burned) while the kiln is slowly rotated about its longitudinal axis in case of rotary kiln or from top to bottom in shaft kilns.

King Roll: The bottom roll in a calender stack, and the only driven roll.

Kinking: A refining action producing fibres containing an abrupt change in the radius of curvature.

Kneader Pulper: A type of pulper designed to fibreize wetted, shredded wastepapers prior to deinking. It consists primarily of a receiving hopper which feeds a conical chamber enclosure fitted with a driven rotating shaft equipped with kneader arms.

Knife Barker: A machine used to remove bark from pulpwood logs, consisting of a set of rotating knives.

Knife Coating: A coating process in which a doctor, knife, or a straight edge is employed to spread control the amount of coating on the paper.

Knife Edge: The edge of the paper which is cut by a knife. It may be press trimmed or cut with a rotary knife.

Knives: Sharp blades, usually made of steel, for paper cutters, trimmers, pulpwood chippers, and other cutting machines used in the mill.

Knockoff Shower: A high pressure shower located so as to remove any material adhering to a paper machine roll or other roll.

Knot Catcher: See 'Knot Drainer' or 'Knotter'.

Knot Drainer: Type of screening device that separates the uncooked wood materials from the pulp pumped from the blow tank. See 'Knot Chatcher' or 'Knotter'.

Knots: (a) Lumps in paper stock resulting from incomplete defibred pulp or textile materials. (b) Uncooked or semicooked chips separated during coarse screening or cooked pulp over vibrating screen called knot catcher.

Kraft: Relating to the sulphate pulping process, the resulting pulp and the paper or board made therefrom.

Kraft Bag Paper: A paper made of sulphate pulp and used in the manufacture of paper bags. It normally has a greater bulk and a rougher surface than the usual kraft wrapping paper. So-called kraft bag papers have been made from sulphite pulp and coloured to resembles a true kraft bag paper.

Kraft Board: A paperboard in various thicknesses made of kraft pulp. The chief characteristics of this board are its strength and being qualities.

Kraft Corrugating Medium: A corrugating medium usually made on a fourdrinier machine from a furnish which is 75 percent or more virgin kraft pulp.

Kraft Liner: Liner made from a furnish containing mechanically strong unbleached pulp made by kraft process of cooking.

Kraft Manila: Any paper made from kraft pulp, which is coloured yellow to simulate a manila shade.

Kraft Paper: Paper of high mechanical strength made out of kraft pulp.

Kraft Pulp: Pulp produced by a process where the active cooking agent is a mixture of sodium hydroxide and sodium sulphide. The term 'Kraft' is commonly

used interchangeably with 'Sulphate' and is derived from a German word which means 'strong'.

Kraft Recovery Cycle: The series of unit processes in a sulphate pulp mill in which the spent cooking liquor is separated from the pulp by washing, concentrated by evaporation, supplemented to make up for lost chemicals, and burned to recover inorganic chemicals. These recovered chemicals are converted to new cooking liquor by reacting them with fresh and recovered lime in a causticizing operation.

Kraft Twisting: A kraft paper suitable for twisting into paper twine, etc.

Kraft Waterproof: A kraft wrapping paper which has been treated with paraffin, asphalt, or other material to render the sheet highly resistant to penetration by moisture.

Kraft Wrapping: A wrapping sheet for general commercial purposes, made of kraft pulp. M.F. and M.G. finish.

Kraft Liner-Board: A linerboard made on a cylinder or fourdrinier machine from a furnish containing 80 percent or more virgin kraft pulp. Nominal grade weights range from 125 gsm to 440 gsm and thickness from 0.230 mm to 0.765 mm.

Knotters: See 'Knots Catcher' or Knot Drainer'.

Kieselguhr: See 'Diatomaceous Silica'.

L

Label Cloth: A cloth-lined paper used when extra strength is required.

Label Manila Paper: Any paper of manila colour made especially for gumming. The gummed paper should be flat.

Label Paper: A paper usually made from chemical pulp for label printing. It normally has a smooth machine or supercalendered finish for good lithographing and gumming qualities, and when coated on one side, it is referred to as C1S Label.

Lace Paper: A bleached chemical pulp papers hard sized, with good tensile and tearing strength. Cleanliness is of great importance. This paper is sold in jumbo rolls to converters, who slit it to the desired widths and use it for the manufacture of paper dollies, box laces, valentines, etc.

Lacquer: A solution in an organic solvent of a natural or synthetic resin, a cellulose ester, such as cellulose nitrate or cellulose acetate, or a cellulose ether, such as methyl or benzyl cellulose, etc, together with modifying agents, such as plasticizers, resins, waxes, and pigments. The solvent evaporates after application of the lacquer, leaving the dissolved material as a shiny, more or less continuous protecting film on the surface of the material so treated. Lacquers are used

for coating paper to give them functional qualities such as decreased water-vapour transmission rates, heat-sealing properties, grease resistance, gloss, and decorative effects.

Lacquered Paper: A general term for any paper which has been coated on one or both sides with a lacquer or plastic.

Ladle Dryer: See 'Flat Dryer'.

Lag: A delay in any system output response with respect to a change input.

Lagoon: (a) A shallow body of water, as a pond or lake, which usually has a shallow, restricted inlet from the sea. (b) A pond containing raw or partially treated wastewater in which aerobic or anaerobic stabilization occurs.

Laid: The ribbed appearance in writing and printing papers produced by the use of a dandy roll on which the wires are laid side by side instead of being woven transversely.

Laid Antique: (a) Any paper watermarked with a laid dandy roll. (b) A book or writing paper having an overall laid watermark and an antique finish.

Laid Dandy Roll: A dandy roll made with wires parallel to the axis of the roll and attached to the frame and kept in position by chain wires evenly spaced and encircling the circumference of the roll. This creates a ladder-like appearance in the sheets of paper.

Laid Lines: The closely, spaced light lines in laid papers, produced by the laid wires of the mould or dandy roll. Laid lines usually run across the grain of the paper but spiral laid paper has lines parallel with the grain or in the machine direction.

Laid Mould: A hand mould in which the cover or sieve is composed of wires laid parallel to each other in contradiction to a woven mouldformed of wire cloth. It is used to make laid paper.

Laid Paper: Paper watermarked with a laid dandy roll.

Laid Wires: The closely spaced wires of a laid dandy roll.

Laid Writing: A correspondence paper usually made from chemical and/or cotton pulps and characterized by an overall laid watermark.

Laminated Board: Paperboard laminated either by (a) combining two or more plies of board plies. (b) combining to it on either one or two sides, a paper, plastic film, or other sheet material with specific properties. The adhesive used may be either a water solution of glue, casein, or starch, or a thermo plastic wax or resin composition. The lining may be of such grades of paper as book or hanging, for the general purpose of improving the appearance and the printing surface of the board, or a special barrier material such as greaseproof or glassine for the purpose of imparting

some specific property which could not be built into the board itself.

Laminated Glassine: Laminated glassine is made of two or more sheets of glassine bonded together with an adhesive. When a wax base adhesive is used the resulting paper is resistant to the passage of water vapour.

Laminated Paper: A laminated product made of paper only.

Laminating: (a) The operation of combining two or more layers of paper or paperboard with an adhesive in such a way as to form a multi-ply paper product, the purpose generally being to increase thickness and rigidity or to impart special properties, for example, moisture and grease resistance. An example is the lamination of glassine or greaseproof to paperboard with a thermoplastic wax or resin combination for the baking industry. (b) The operation of combining similar or dissimilar webs for the purpose of obtaining added strength and improved resistance to moisture vapour and grease on the folds and creases in packaging papers, also, improved functional properties such as toughness, pliability on automatic packaging equipment and the like.

Lamination: Made by superposing two or more layers of the same or dissimilar materials with or without adhesive.

Lamine (Paper or Board): Paper or board that has been passed through a thickness (caliper) calender (*see* Calender) suitable for giving it uniform thickness.

Lampshade Bristol: A well-formed, clean bristol with high oil absorbancy decorated by the converter and used for lampshades. It is usually made with particular attention to translucency and cleanliness after oiling.

Lampshade Paper: A paper used to cover the frame in lampshades in place of textiles. It is usually made of chemical pulps, a heavy vegetable parchment, or laminated glassine. Ability to absorb flame-resistant or retardant materials and materials to give translucency are significant properties.

Lapping: The operation of extracting water from screened pulp by a wet press and collecting the fibres in sheets dry enough to enable them to be folded or lapped into a stack or bundle.

Laps: Folded sheets of wet pulp as they come from the wet machine for shipment or for storage. The pulp usually contains moisture from 35 to 55 percent by weight of dry pulp.

Late-Wood: That portion of a tree that grown during the late summer and autumn seasons of the year. It is a slower growing wood and produces cells with thicker walls and narrower cavities. Sometimes referred to as summer wood.

Latency: The curl and spiral of individual pulp fibres produced during the mechanical action in refiners, especially in the thermomechanical pulping process.

Latency Chest: A storage chest after the second stage refiner in a thermomechanical pulping process in which pulp is placed and or agitated at a specified temperature for a predetermined time to remove the curl and spiral (latent) produced on the individual fibres by mechanical action in the refiners.

Latent Heat of Vaporisation: *See* 'Heat of Condensation'.

Lateral Porosity: Porosity measured in a direction parallel with the plane of the sheet. Some times called transverse porosity.

Latex: A colloidal water dispersion of high polymers from sources related to natural rubber or of synthetic high polymers which resemble natural rubber. The term was originally applied to the milky sap obtained from the Hevea tree. Latex is used in paper as an adhesive, in pigment coating, as a barrier coating and as a saturant for speciality papers.

Latex-Treated Papers: Paper manufactured by two major processes. In one rubber latex is incorporated with the fibres in the beater prior to formation of the sheet. In the other a preformed web of absorbent fibre is saturated with properly compounded latex. Paper made by the beater process can be produced on any of the regular types of paper making machinery including cylinder, fourdrinier and wet machines. Latex-impregnated papers made by the saturating process are manufactured on specially designed equipment consisting essentially of a suitable bath for impregnation, a pair of squeeze rolls for removal of excess latex, and drying equipment. Fibres commonly used consists of rags and chemical pulp. They vary widely in their physical and chemical characteristics. As class they are characterised by toughness, folding endurance, flexibility, durability and resistance to splitting and abrasion in varying degree as may be necessary to meet end-use requirements. The heavier products find use in the shoe industry as innersoles and midsoles. The mechanical and process industries use them as gaskets. The thinner products are used variously; by the artificial leather industry in coated form as simulated leather by the pressure-sensitive tape industry as a base for masking, holding and protective tapes, by the automobile manufacturing industry as an antisqueak and facing materials.

Lawn Finish: A finish produced with very fine-weave linen cloth on a plater press. It is distinguished from linen finish in that the paper is conditioned to increase the moisture content before plating. The plater book is made up of a zinc plate, a sheet of linen, a sheet of paper, a sheet of linen, and a zinc plate and the number of books made up to the capacity of the plater. It is

plated under heavy pressure giving a smooth but distinct linen surface to the paper; the effect is especially apparent when looking through the paper. It is used particularly with papeteries.

Lay Boy: See 'Delivery Table'.

Layer Board: A paperboard used to separate two or more layers in packaging of candies, crackers, etc, and to form nestings stiff enough for the purpose. It may be plain or surface coated with a grease-resistant material.

Layer Insulation Paper: An unbleached kraft paper with a high dielectric strength which is used between layers of wire in transformers. Depending upon the usage it may be high-density, water-finished paper made from well-hydrated stock or it may be flow-density paper from relatively free stock. It must be flexible without cracking and free from metallic or other conducting particles. It must be able to withstand long exposure to elevated temperatures and may be chemically treated to improve this property. Since power transformers are usually oil-filled, this paper is completely saturated with and immersed in oil.

Leachate: Liquid that has percolated through solid waste or other mediums and has extracted dissolved or suspended materials from it.

Leaching: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil, or into ground waters.

Lead Dryer: The first, and usually a smaller, steam dryer drum in the dryer section of a paper machine following the press section.

Leading Roll: The first roll in a bank, series, or section of rolls on any mill process equipment.

Leaf Fibre: A fibre from a leaf or leaf stalk such as New Zealand flax, sisal pineapple, manila (abaca).

Leatherette: Paper surface-coloured and embossed to have the appearance of leather used for box covering and fancy covers for books and note-books.

Ledger Paper: Originally a smooth, well-sized strong writing paper characterized by good tearing resistance, high folding endurance ruling quality, permanence, durability, etc, and used for manual (that is pen and ink) entry account books, ledgers record books, diaries and the like. The term is now applicable to a broad variety of chemical pulp record-type papers used in mechanical-entry accounting machines, loose-leaf and other notebooks, etc. Ledger papers are commonly made in white, buff and green-tint shades (see Ivory Ledger).

Lens Tissue: A tissue paper used for wrapping and polishing photographic, optical, and other lenses and for other cleaning purposes requiring high grade tissue. It is made of long fibred stock which is free of

unbleached and mechanical pulp. The paper has a high degree of softness and is free of abrasiveness, lint, or dusting. It is uncalendered. Certain papers contain a silicone and others are given a wet-strength treatment for heavy-duty wet cleaning applications.

Letter-Copying Paper: Typical writing paper of manifold grade suitable for use in obtaining several copies of the same letter.

Letter Paper: Writing paper cut to proper size for correspondence purposes.

Letterpress Printing: A process also known as relief or typographic printing. These are interchangeable terms applied to any printing produced from a raised, or relief surface—as distinct from planographic or intaglio printing. It employs type or plates or any character cast or engraved in relief on metal, wood, rubber, linoleum, etc. The ink is applied to the printing surface below which all non-printing areas or spaces are recessed (the exact opposite of gravure or intaglio printing). Impressions are made by pressure against a flat area of type or plate (as on a platen press), by pressure of a cylinder rolling across a flat area of type (flat-bed cylinder press printing), or by having a cylindrical plate against which another impression cylinder revolves, carrying a continuous paper web. Rotary printing of flat sheets is also common, this being accomplished by having the printing area electrotyped—that is duplicated in a copper or other metal plate which is then curved to fit the plate cylinder.

Lick Up Couch: A grooved couch roll, usually associated with a rubber covered top roll, commonly used for sheet transfer from wire to press section on tissue paper machines.

Lick-Up Felt: A felt that is pressed against the sheet in the nip of a lick-up couch roll and rubber-covered top roll. It is used to pick up and carry the sheet from the wire to the first press on a tissue paper machine.

Life: The length of time from initial installation of paper machine wires and felts to the time they have to be removed and replaced due to wear. Also applicable to any machinery, equipment, building, etc.

Lift: A quantity of sheets of paper or paperboard which can be readily lifted from one operation to another.

Light-Weight Papers: All papers having a substance (see 'Substance') of less than 40 g/m².

Lighter Bar: A lever that carries the roll spindle of a pulp beater. Its manipulation is the most common means of making a roll adjustments.

Light Weight: A term applied to papers made in grammages below the normal minimum grammage of the grade in question.

Lignin: The noncarbohydrate portion of the middle lamella of plant material; it is usually determined as the residue after hydrolysis with strong acid of the plant material, after removal of waxes, tannins, and other extractives. Lignin is amorphous, has high molecular weight and is predominantly aromatic in structure. It is not one compound, but varies in composition with the method of isolation and with the species, age, growing conditions, etc., of the plant. It is more or less completely removed during chemical pulping, but is not removed by mechanical pulping. Bleaching of the pulp further removes or modifies any remaining lignin.

Lignosulphonate: A product resulting from the reaction of lignin and an alkali sulfur sulphite in a pulping process. Sulphonate groups are introduced into the lignin molecule.

Lime: Technically calcium oxide (CaO) or quicklime as it is also called. It is produced by heating limestone to a temperature generally around 1 100°C when CaCO_3 decomposes to CaO and CO_2 . Lime solutions are used to prepare bleaching and pulping liquors in the paper industry.

Lime Mud: The primarily calcium carbonate (CaCO_3) sludge that settles out and is separated from the white liquor during the clarification operation in the causticizing process in a pulp mill recovery cycle prior to pumping over to the lime recovery area. Also called white mud or filter sludge.

Lime Mud Filter: A continuous vacuum type rotary filter located in the lime recovery area of a sulphate pulp mill. It is used for removing liquids from lime mud to make the mud cake suitable for disposal or reburning.

Lime Slaking: The mixing of lime (CaO) with water (H_2O) to form lime water or calcium hydroxide [$\text{Ca}(\text{OH})_2$]. In the causticizing process of a sulphate pulp mill recovery cycle, it is the mixing of lime with screen liquor.

Line Shaft: The main power links (shafts) that connect the electric motor, steam turbine, or steam engine prime mover on a paper machine drive to the various sections to be driven. Accomplished through couplings, pulleys, belts and gears.

Line Shaft Drive: A type of paper machine drive consisting of a single prime mover with the line shaft connected to enclosed right angle gear units and input shafts at each drive point on the machine by a system of felts and cone pulleys.

Linear Laid: A thin writing paper with watermarked lines to serve as a guide in writing.

Lined Board: (a) Mill-lined or laminated; any board that is lined with paper such as newsprint, book paper, cover paper, etc., after the board is made on the board machine and while it is still in the roll, before being

cut into sheets. (b) Vat-lined; any board made on a cylinder machine, where the top or bottom liner or both are of different quality stock from the filler or center of the board. This term refers to a one-process sheet, the liner or liners being a part of the board as it is being formed on the wet end of the machine. (c) Sheet-lined; Board that is pasted, sheet by sheet, on a sheet-lining machine. Any board can be sheet lined with any quality of lining paper.

Linens: Linen fibres are the bast fibres of the flax plant. In the paper industry it usually refers to the linen rags and cuttings received from the textile industry for use in the manufacture of high quality cotton fibre content paper which term embraces both cotton and linen. Chemical pulp derived from the flax plant is called flax pulp.

Linen Finish: A finish produced by compressing sheets of paper between alternate sheets of linen cloth so that the patterns of the cloth is impressed upon the surface of the paper or by pressing the continuous web of paper between two endless belts of linen cloth by means of press rolls. A similar effect is obtained by embossing a continuous web of paper with a steel roll which has been knurled or engraved to simulate the surface of linen cloth.

Linen Paper: (a) Unless otherwise indicated, paper which has a lined finish. (b) A paper made wholly or in part from linen rags.

Linen-Faced Paper: Originally, a wrapping paper or other paper linen or faced, on one or both sides, with linen, but now a paper with a linen finish. Original meaning is usually covered by the terms cloth-lined, faced, or mounted.

Liner: A generic term for any paper or board intended for covering another paper or board material, by adhesion to become a part of the finished product.

Lint: (a) Particles of fibres that separated or 'dust off' from paper during manufacturing or converting operations. *See* 'Fluff'. (b) The ginned cotton textile fibre is technically known as lint.

Linters: *See* 'Cotton Linters'.

Lip: The bottom edge of a paper machine headbox slice whose position determines the jet angle and thickness of the pulp stock being admitted onto the web end wires.

Lips: The bottom and upper section of a paper machine head box slice whose position determine the jet angle and thickness of the pulp stock being admitted onto the wet-end wires.

Liquefier: A chemical added to papermaking animal glue adhesive to lower the gelling temperature.

Liquid Chlorine: The form in which the elemental chlorine is received in the tank cars or cylinders at a pulp mill bleach plant site. It is evaporated in steam heaters before being introduced into the pulp slurry.

Liquor: Chemical solutions used in the manufacture of pulp which change composition as they pass through process stages, for example these from digesting through washing, evaporation, incineration, recausticizing, and back to the digester, and those used in the bleach plant, for example White Liquor, Black Liquor, Green Liquor, Bleach Liquor, etc.

Liquor Droplets: Dispersed spray particles in the stream leaving liquor feed guns or burners in a pulp mill chemical recovery furnace.

Liquor Flash Tank: Enclosed vessels in which hot pressurized liquor relieved from digester is allowed to flash so that vapour heat can be recovered for reuse. The liquor is then sent to the evaporation and recovery operations.

Liquor Spray Guns: Liquor-spraying nozzles through which concentrated bleach liquor is sprayed into a recovery furnace to be burned.

Liquor-to Chips Ratio: The relationship between the total liquid added to a pulp digester, plus the moisture in the chips and the bone dry chips fed or loaded into the digester.

Litho Blanks: Coated blanks which are made of cardboard middles lined with book paper which are clay coated on one or both sides, and are subsequently given a high finish by calendering or plating. Litho blanks are practically clay-coated, book lined blanks, using number 1 or 2 cardboard middles as the coating raw stock. It includes clay-coated litho boards, coated litho boards, coated blanks, coated litho blanks and clay-coated litho blanks.

Litho Coated Paper: A paper coated on one side with a coating made to withstand the water used in the lithograph process. It is made in a wide range of basis weights. Good pick strength is essential.

Lithograph Paper: A paper for use in lithographic printing made of bleached chemical pulp alone or in combination with mechanical wood pulp or deinked paper stock. Essential characteristics are surface cleanliness, a degree of water resistance, sufficient to inhibit penetration into the paper of water encountered in the printing process, relative freedom from curl and high pick strength. The paper is made both uncoated and coated in either sheets or rolls and with machine, supercalendered or duplex finishes.

Lithography: The original meaning of lithography was based on the affinity of a greasy surface for printers ink, the ink being also repelled by a damp surface. It involved the preparation of designs on a stone with a special crayon on liquid drawing medium and the production of printed impressions therefrom on a flat-bed press. Today it is divided into two classes. Direct lithography and offset lithography.

Lithophone: A mixture of 28-30 percent zinc sulphide with 72-70 percent of barium sulphate, resulting from

the cross precipitation of barium sulphide and zinc sulphate solutions. The pigment is used as a filler in paper.

Live Bottom: The bottom of a storage chest or bin which is designed so that mechanical motion, usually supplied by a screw or drag chain conveyor, can be imparted to aid in removal of stored materials.

Live Steam: Full pressure steam as it comes from a boiler.

Load: The total force applied to a given specimen in testing for such properties as compression resistance and tensile strength of paper or paper board. Load differs from stress; the latter is force per unit of load area. Load, rather than stress, is usually used because of difficulty in determining the loaded (Cross-sectional) area of paper.

Load Factor: An electrical term expressing the ratio of the average power to the peak power used by a mill, or a machine or system within a mill.

Loading: (a) The incorporation of finely divided relatively insoluble materials, such as clay, talc, calcium carbonate, etc., in the paper making composition, usually prior to sheet formation, to modify certain characteristics of the finished sheet, including opacity, texture, printability, finish weight, etc. (b) Mineral matter, such as clay, etc., used as a filler in paper.

Loan: High-grade stout writing paper containing high percentage of rag and generally tub-sized. Made exceptionally strong for use as bank notes, legal documents, agreements, etc.

Localised Watermark: A watermark arranged to appear at definite intervals in a sheet of paper.

Locust Bean Gum: A polysaccharide derived from the seed endosperm of the locust bean like guar or carob tree grown in the Mediterranean regions of Africa and Europe; used as a beater or wet-end additive primarily for improving strength properties.

Loft Drying: A form of air drying. The wet paper is hung over poles in a drying loft, where the atmospheric conditions are regulated to give the desired rate of drying. Now nearly obsolete as a commercial practice.

Log Flume: A channel or chute filled with mechanically moved water used for conveying logs from a storage area to a debarking facility in the wood preparation operation of a pulp mill.

Log Pond: A natural or artificial pond of water where pulpwood logs in some mills are gathered and stored prior to being transported to the wood preparation area.

Log Splitter: A log cutting machine used in the wood preparation area of pulp mills to split large diameter logs into smaller sizes so that they will slide through

chipper chute openings or better fit the pulpwood grinder pockets.

Log Transportation: The movement of pulpwood logs by conveyors or flumes from storage area to debarking facilities in the wood preparation operation of a pulp mill.

Logger: An instrument that automatically scans certain measurement signals generated by a controlled process and records, usually in chronological order, the readings in a numerical format for future reference and other uses.

Logging: Process of cutting down trees and removing the raw unprocessed products such as tree lengths, saw timber, pulp-wood, logs, bolts and whole tree chips from the forest.

Logic: The systematic method by which system information is processed with each successive step influencing the next.

Long Fold: A term denoting that if folded lengthwise, the sheet will be folded with the grain. In bristol boards the term indicates that the grain runs lengthwise.

Long Stock: Stock which after refining, has a relatively long fibre that is one in which the fibres have not been greatly reduced in length by the refining treatment.

Long Tube Evaporator: A type of spent liquor evaporator used in pulp mills characterised by long vertical tubes through which boiling liquor drives a mixture of vapour and liquor at a high velocity, depositing a thin film on the tube walls where water is further driven off to concentrate the liquor. Also referred to as falling film evaporator or vertical film type evaporator.

Look Through: The appearance of paper when viewed by transmitted light, thus disclosing the texture or formation of the sheet.

Loose Coating: Coating not firmly bound to the base stock, tending to pick during printing.

Lottery Paper: A general term for papers which are used for lottery tickets. Usually such papers are treated to prevent fraudulent alterations or duplication.

Loudspeaker (Radio) Cone Paper: A paper characterised by its bulk and low finish, which is made of chemical pulp or cotton fibres which may be blended with other types of fibres, on a fourdrinier machine. The stock has a relatively high freeness. The paper may be slack sized to improve its handling properties during the conversion operation. The paper is used in the manufacture of conoidal diaphragms for radio loudspeakers.

Louver: An air-damping device made up of metal slats located in the stream in a way as to allow adjustment to regulate the air flows.

Low-Angle Gloss: The gloss of paper measured at 75° from the vertical. This angle is chosen as that most nearly duplicating the angle at which an observer judges the gloss using the naked eye.

Low Count: A number of sheets less than the standard number required in a bundle of paper or a ream of paper.

Lubricants: Chemicals added to paper-coating preparations primarily to improve flow properties. Their use results in a smoother coating with improved finish and printing qualities, along with other associated property enhancements. Also refers to chemical agents providing lubrication for dynamic machinery parts.

Lumen: The centre void portion of a wood fibre.

Luminous Reflectivity: One of the three qualities necessary for specifying a colour. It is the ratio of the luminosity of the illuminated specimen to that of a standard reflector when both specimen and standard reflector are illuminated by a specified illuminant under identical conditions and as viewed by a standard observer. Luminous reflectivity can be calculated by a standard procedure when the spectral reflectivity of the specimen is known. Also, it can be measured directly with a suitable colourimeter.

Lump: A localised thickened area in paper caused by an agglomeration of fibre or other materials.

Lump Breaker Roll: See 'Breaker Roll'.

Luster: (a) That part of the gloss property of paper that is related to the selective reflection of light as compared with its counter-part, gloss, which is related to the reflection of excessively bright light. (b) The surface shine or sheen appearance of paper and paperboard as related to the amount of light reflected from it.

Lambert: A fibreboard case consisting of one or two creased sheets placed within an outer sleeve to which it is (they are) stitched or taped. The outer sleeve forms the body and the creased sheet(s) form(s) the bottom and lid, and the same time strengthen(s) the sides.

Lamellae: The layers which make up the cell wall of a wool fibre and contain the fibrils.

Linting: The release from paper or board of fluff or dust, consisting mainly individual fibres or particles of loading or sizing agents or various aggregates of these materials during the printing operation. These particles may be completely loose on the body or loosely bonded into it, but capable of being removed at some stage in the printing operation, causing hindrance in printing operation. See also 'Dusting', 'Fluffing'.

M

M.G. Cylinder: Highly polished metal cylinder which imparts glaze, gloss, smoothness, etc, on the

surface of paper or board and forms part of the drying section of the paper machine.

M.G. Sulphite Wrapping Paper: A predominately sulphite sheet made on a Yankee machine in various weights and colours. It has a high-glazed finish on one side and a relatively rough finish on the reverse side.

M.G. Violet Poster Paper: Generally a light weight M.G. Paper in violet colour, also known as Match paper, as it is used for wrapping match stick boxes, and fire works articles.

Maceration: The softening and separation of wood chips or fibre bundles into their component parts by the application of a physical mechanical treatment.

Machine-Broke: Wet or dry paper resulting from breaks in the paper web during manufacture, or defective paper discarded at the dry end of the machine.

Machine Chest: A large agitated storage tank located just ahead of the paper machine in which the stock furnish being pumped to the paper machine is stored. Sometimes called a stuff chest.

Machine Clothing: The fourdrinier wire and felts of a paper machine. The term may also include deckle straps, aprons, jackets and other travelling parts.

Machine Coated: Paper or board which during the process of manufacture has been coated with a mixture of a mineral pigment and a suitable adhesive by means of a device which is a part of the paper machine.

Machine Coating: The process of applying coating to paper or paper board with equipment which is an integral part of the paper machine. It is sometimes called on-machine coating and is distinguished from off-machine coating or conversion coating.

Machine Deckle: The distance between the deckle straps (*See* 'Deckle Straps') or deckle board (*see* 'Deckle Board') of a paper board making machine.

Machine Direction: The direction of paper parallel to the direction of movement on the paper machine. It is also called grain direction. The direction at right angles to the machine direction is called the cross-machine direction or simply cross direction.

Machine Dried: Dried on the paper machine by passing over steam-heated cylinders.

Machine Dried Pulp: Market pulp that was dried over the steam-heated dryer drums of a pulp dryer section.

Machine Drive: The mechanism used to impart motion to various sections of a paper machine. The motion can be obtained from one source, such as a motor, with each section connected to it, or from an individual sources for each individual section.

Machine Efficiency: The amount of paper produced on a paper machine in relation to the potential production capacity.

Machine Fill: The actual width of a paper or board making machine taken up by a particular making. Ideally this should closely approach the maximum trimmed machine width.

Machine Finish: (a) Any finish obtained on a paper machine. It may be that of the sheet as it leaves the last drier or as it leaves the calender stack. It may also be a dry or water finish. (b) When used in conjunction with the name of a grade or type of paper a machine finish of less than the maximum range of smoothness.

Machine Finish Book Paper (M.F. Book): A printing paper having medium finish, good opacity, printability and suitability for book printing. It is normally made from chemical pulp and must usually confirm to specific standards.

Machine Finished Paper or Board (M.F. Paper or Board): Paper or Board treated mechanically on a paper machine to obtain a smoother and more uniform appearance on both sides than on the unfinished paper or board (*see* 'Unfinished paper or board').

Machine Glazed: The finish produced on a Yankee machine, where the paper is pressed against a large steam-heated highly polished revolving cylinder, which dries the sheet and imparts a high glazed surface on the side next to the cylinder, leaving the otherside rough that is with the texture of the felt used on the machine.

Machine Glazed Litho: A printing paper made from chemical and/or reclaimed pulp on a Yankee machine which gives a high finish on one side and a relatively rough finish on the other. It also referred to as M.G. Litho.

Machine Glazed Paper or Board (M.G. Paper or Board): Paper or Board which has had one side made smooth and glossy by drying on a heated, polished, metal cylinder which forces part of the drying section of the machine. The other side of the paper or board remains relatively rough.

Machine Imprinted: Having a design or mark impressed by means of a metal or rubber plate at a point where the paper sheet contains sufficient moisture to be plastic.

Machine Language: A language in binary form existing internally within a computer and executed by the computer for its operation.

Machine Loading: The application of loading material to the surface of paper on the paper machine at the size press. It is differentiated from machine coating by the physical characteristics of the material applied and the equipment used.

Machine Made Deckle Edge Paper: A paper used as a cover or text stock, for announcements, greeting cards, house organs, and advertising pieces, etc. It is similar in texture, surface, properties, and deckle edges to handmade paper but manufactured instead on

paper machines. The paper is made from cotton fibre and chemical pulp.

Machine Mark Stripes: A series of stripes on a paper web running in the machine direction resulting from the application of devices to the surface of the sheet while being formed on the fourdrinier wire. These stripes are used for identification purposes, particularly in the enforcement of tariff regulations.

Machine Pit: The receiving chest located under the wet end section of some paper machines for draining white water from the sheet forming section of the wire where the tables, rolls, and foils are located.

Magazine Paper: Any of a wide range of coated and uncoated book-type papers used for magazine or periodical printing.

Magazine Stock: Pulp produced by deinking printed magazines and books and often used with other pulps for making paper.

Magnesite Process: A magnesium based sulphite pulping process.

Magnesium Bisulphite: A chemical used in the magnesium-based pulping process.

Main Frame: The central physical structure of a computer with no external devices connected to it by cabling.

Main Press: The press that drives each section of a cylinder-board machine, which is usually a suction press.

Main Squirt: The high-pressure water jet used on the wet end of a paper machine to cut a tail on the wet web as it is fed from the wire to the wet press and expands the web once it is fed through the presses.

Main Steam: The high-pressure steam that comes from the primary super-heater of boilers and is sent to the first high-pressure stage of the turbine generator.

Make and Hold Order: A given quantity of paper which is made on order and held by the manufacturer awaiting customer shipping instructions.

Makeready Tissue: A sheet of manila-coloured tissue, well sized, which is used in the print shop for making a form ready for printing.

Makeup Alkali Consumption: Weight of chemical consumed in the manufacture of a tonne of air-dried pulp by the sulphate process, and include salt cake (Na_2SO_4), Soda Ash (Na_2CO_3), Caustic Soda (NaOH), and other sodium compounds expressed as Na_2O .

Makeup Chemical Consumption: The weight of salt cake (Na_2SO_4) or other sodium compounds expressed as Na_2SO_4 or Na_2O per tonne of air-dried pulp production that must be added to the recovery process to maintain an even sodium level in the cooking liquor in alkaline-type pulp mills.

Makeup Salt Cake: The sodium sulphate (Na_2SO_4) added to the sulphate black liquor just before incineration in the recovery furnace to make up for the loss of sodium (Na) and Sulphur (S) in the process.

Makeup Water: The treated water that is pumped into a steam boiler system to make up for losses at various points, such as leakages through pump bearings, steam leakages through valve packings, condensate loss, blowdowns, etc.

Making Order: Any order that is not supplied from stock and is made to the purchaser's specifications.

Male Thread: The external thread on pipes, fittings, valves, etc., for making screwed connections.

Mandrel: The shaft or spindle that holds the bearings and spindle of the burr-holding assembly used to dress the stone on a pulpmill grinder.

Manifold: The stock line piping arrangement located just before the furnish enters the headbox of a paper machine. It spreads and distributes the large pipe flow to a more even flow along the width of the headbox.

Manifold Paper: A lightweight writing paper designed primarily for carbon copies of typewritten material. It is normally made from chemical pulps with smooth or matte finish with substance around 35 g/m^2 .

Manila: Relatively strong paper made from bleached or semi-bleached pulp usually used for file covers, folders, envelopes, etc.

Manila Rope Shipping Sack Paper: Cylinder-made paper containing 75 percent or more of manila rag fibres and used in the construction of single (and sometimes double wall) paper shipping sacks.

Manila Wrapping: A term applied to a group of manila coloured wrapping papers, made of chemical, or a mixture of chemical and mechanical pulps. They are used for various wrapping and printing purposes and also for envelopes, filling folders, etc.

Manipulated Variable: The quantity or condition in a controlled process that must be changed to maintain another quantity or condition (controlled variable) to a desired value.

Mannogalacten: A carbohydrate found in the seeds of certain plants like guar gum which, upon acid hydrolysis, yields mannose and galactose sugars. Mannogalactan (also called galactomannan) is used in papermaking as a beater or wet-end additive to improve sheet formation and fibre bonding.

Manual Backup: An alternative method to automatic control of the pulp and paper process by means of manual adjustment of the final operator mechanism.

Manual Control: Controlling process variables by manually adjusting the final compensating control devices. Sometimes referred to as hand control.

Manuscript Cover: A lightweight cover paper, used for protecting legal papers and manuscripts. It is made of varying proportions of chemical pulps, with or without the inclusion of cotton fibre.

Map Litho Paper: A paper free of fuzz, heavily sized, whether surface sized or not depending upon end use, smooth, of high dimensional stability with good mechanical strength in particular. This paper should also have good printing property, that is high pick number to withstand the tackiness of the printing ink.

Map Paper: It is used for making maps in sheet, book or pamphlet. It is made from any long fibre or chemical bamboo pulp or chemical wood pulp or a mixture of these depending upon its end use and is sometimes supercalendered. Significant properties are finish, matt or smooth, printing quality, dimensional stability, good folding properties and in some cases (road maps) high opacity. For special uses, map papers are treated to impart high wet strength, water repellency, and other properties pertaining to a particular use.

Manufacturer's Joint: That part of a case which is joined together by the manufacturer by taping, stitching or gluing.

Marble Paper: (a) A decorated end-leaf paper used in blank and printed books. (b) An intaglio-printed end-leaf paper comprising a marble-like pattern. (c) An old style wallpaper with the appearance of marble.

Mark: The design or impression in paper produced by a water-mark or by the use of embossing rollers of marking felts.

Market Pulp: Any pulp produced for, and sold on the open market, as opposed to that which is produced for internal consumption by an integrated pulp and paper mill.

Marking Felt: A paper machine wet-end press felt especially manufactured to impress a specific pattern symbol, mark, or design on the sheet of paper with which it comes into contact.

Marking Press: A rubber covered roll with a raised or recessed pattern used in conjunction with a press roll in the press section of the paper machine to produce a rubber mark.

Masking Paper: Any paper used to block out the surface of a design so that after using an air brush, the portion of the design covered by the paper is not painted or enameled. It is used principally in the finishing of automobiles.

Mat Board: A paperboard lined with a plain or decorated cover paper. It possesses rigidity and is used for mounting specimens or articles.

Mat Stock: A matte-finished cover stock in various furnishes and colours which is used for mounting pictures, pamphlet covers, etc.

Match Book Cover Board: A paperboard used for the outside covers of books of paper matches. It is made of bleached machine-lined board white patent-coated or clay-coated board. The board is a good binder with a surface suitable for printing in colours.

Match Box Board: A paperboard used for making boxes in which matches are packed. It is manila-lined chipboard with a surface suitable for printing. It possesses good bending qualities.

Match Stem Stock: A paperboard sometimes news filled, and frequently coloured. It is used for the shaft of the matches contained in match box. The board is stiff and absorbent for receiving the chemicals necessary in match making.

Matching: The procedure of achieving the equivalent colour and shade on a particular run of paper being made on a paper machine to an order previously made with the same colour specifications.

Material Balance: Methods of calculating the performance of pulp and paper equipment or unit process, such as washers, evaporators, etc., by comparing the total input of all materials to the total output of all materials.

Materials Handling: The movement and transportation of raw materials and products from one part of a pulp and paper mill to another, including the preparation of the product for shipping out of the mill.

Matrix: The mould in which printing plates are cast.

Matrix Board: (a) Sterotype dry mat. A board used for making a mold for casting printing plates primarily for newspapers, magazines and commercial advertising work. Mats are made in two ranges of thickness; the first is 0.6 to 0.9 mm and such mats require packing or support, after molding, in the space which are not to print from the printing plates; a higher range of thickness is 1.40 to 1.78 mm for packless mats; such mats take the entire depth of impression in moulding and are flat on the back so do not require supplementary packing. Important properties of the dry mat are the ability to stretch without fracture and compress during the moulding operation, a smooth surface texture which will accurately reproduce details in the copy, and in newspaper mats shrinkage is of particular importance. *See* 'Flong'.

Matt Finish: A term used to designate a finish low in gloss.

Matte Art Paper: Art paper having a matt (dull) finish.

Mature: Seasoned for some time before use.

Maturing: Evolution, generally favourable, of the characteristics of paper or board during storage.

Maximum Deckle: The maximum distance possible between the deckle straps (*see* 'Deckle Straps') or

deckle boards (*see* 'Deckle Boards') of a paper or board making machine.

Maximum Trimmed Machine Width: The maximum width of paper or board possible to make on a given machine, the width being determined after the removal of a minimum amount of trim to eliminate the rough edges formed during manufacture.

Measured Variable: The physical quantity, property, or condition of the pulp and papermaking process that is measured by an instrument and control system.

Measuring Elements: Those devices in an instrument and control system which ascertain the value of the measured process variables.

Measuring Tanks: Storage tanks located above the batch digester in a pulp mill into which cooking liquors are drawn and pumped in measured amounts into the digester for each cook. Also called draw down tanks.

Mechanical Aerator: A mechanical device for the introduction of atmospheric oxygen into a liquid.

Mechanical Deckle Edge Paper: An imitation deckle edge paper produced by subjecting the edge or edges of the dry sheet to mechanical abrasion or other treatment.

Mechanical Drive: A method of moving separate sections of a paper machine by connecting them together through a driving mechanism powered by mechanical means.

Mechanical Interlocking: Changing properties, such as increasing the strength of a synthetic metal-fibre paper web, by calendering to a higher density.

Mechanical Paper: Paper made in major part from mechanical wood pulp.

Mechanical Pulp: Pulp produced by defibring pulpwood logs and chips into their fibre components by the use of mechanical energy, via grinding stones, refiners, etc.

Mechanical Pulp Board: Board made principally from mechanical pulp (*See* 'Mechanical pulp').

Mechanical Refining: Imparting specific properties to pulp fibres by mechanical treatment between moving surfaces in papermaking machinery such as beaters and refiners.

Mechanical Wood Pulp: Any wood pulp manufactured wholly or in part by a mechanical process, including stone-ground wood, chemiground wood and chip mechanical pulp and chemo-thermo-mechanical pulp, etc. Uses include newsprint printing papers, speciality papers, tissue to toweling, paperboard and wallboard.

Mechanochemical Process: A semichemical pulping process used on nonwoody plants, such as straw bagasse and reeds, in which chemical and mechanical actions are used at the same time under atmospheric pressure, producing a high-yield pulp.

Medium Consistency: A generalised reference used to describe pulp slurries having consistencies within the approximate range of 6 to 15 percent, although it may vary somewhat depending on where in the pulp and paper making process the reference is made.

Medium Density Fibre Board: A board manufactured from refined ligno-cellulose fibres with a synthetic resin or other suitable binder which is dry felted and hot pressed to a density of 0.50 to 0.80 g/cm³ by a process in which substantially the entire inter-fibre bond is created by the added binder. Other materials may be added to improve certain properties.

Medium Finish: An intermediate finish that is neither high nor low, nor rough nor smooth. The term may be used with any type of finish.

Melamine Resin Acid Colloid: A cationic colloidal solution of melamine formaldehyde resin in dilute acid, used for imparting wet strength by addition to the furnish paper to sheet formation.

Memo Covers: Cover stock especially made for memorandum, bank and passbooks.

Memory: The storage device or section of a computer in which programmes and data are stored and easily retrieved. It is the central processor unit for manipulation and execution.

Menu Bristol: A heavyweight paper similar to index bristol commonly used for printing menus.

Mercaptan: Any of a class of sulphur containing organic compounds with the type of formula RSH, the low boiling members of which have an extremely offensive order. It is an air pollutant.

Mercerization: The process of treating vegetable fibres with an alkaline reagent, with or without tension, so as to increase their diameter, density, strength, luster and receptiveness to dyes.

Merchant's Brand: A line of papers, the names of which are owned by the paper merchant, in contract to mill brand, where a paper manufacturer is the owner.

Mesh: The number of warp and shute wires per inch determine the mesh of a wire.

Metachromatype Paper: Paper coloured with dyes that undergo colour changes with changes in physical conditions, such as temperature or relative humidity.

Metallic Blotting: A blotting paper laminated with a coated-one-side metallic paper.

Metallic Coating: Coating for either a paper or a board, the pigment content of which is a composition of metallic flakes such as aluminium or bronze powder and the vehicle of which is either (a) casein or other aqueous binder or (b) a lacquer. The bronze may be uncoloured to give the effect of silver, or coloured to give the effect of gold, gunmetal, or their special shades.

Metallic Paper: (a) A specially coated paper to which marks may be made with a metal point or stylus (of silver, aluminium lead, etc) which cannot be erased. It is used for notebooks and indicator diagrams. The coating may be of fine white or a mixture of clay, whiting, lime and barytes. (b) Paper coated with metallic substances to produce the effect of metallic surface or paper which has been combined with metallic foils. (c) Paper which has been coated by the condensation of vapourized metal while in high vacuum. This process is known as vacuum metalizing.

Meter Paper: A ledger paper usually made from chemical pulp. It is commonly used with recording instruments, in circular dial form. Good sizing, freedom from lint, and good dimensional stability are important properties.

Methyl Mercaptans (CH₃SH): The reduced sulphur compound which is formed during the cooking of wood in a sulphate pulp mill and released in mill gaseous effluents. It is primarily responsible for the characteristic offensive odours associated with the sulphate mill environment.

Metric System: An international system of weight and measures.

Metrication: The process of converting from the English system of weights and measures to the Metric system.

Mica Paper: A paper coated with ground mica, usually of 180 mesh or finer, incorporated with an adhesive, such as casein. Dyes may be added for tinting. The coated product may be calendered or embossed and is widely used for greeting folders, box coverings, and other decorative purposes. The base paper is usually of chemical pulp, it should well sized and of uniform formation and density.

Micro Paper: Generally a strong high quality writing paper suitable for magnetic-ink character recognition printing and used in making cheques, bonds, etc.

Micro Kappa Number: The result of a bleachability laboratory test on pulp to determine the bleachability or the amount of lignin by a modification of the standard Kappa number test. It is performed so that it can be used on very small samples and semi-bleached pulp with low permanganate consumption.

Microcrystalline Wax: One of a series of waxes obtained from petroleum and differing from paraffin in having smaller crystal size and in containing more branched-chain hydrocarbons. The colour may range from white to dark brown or black. In general, the microcrystalline waxes are tougher, more flexible more adhesive, and have a higher melting point than the paraffin waxes, although different grades will differ widely. Microcrystalline waxes are used for laminating and in blends with paraffin wax for surface treatment having increased sealing strength.

Micrometer: A measuring device used to determine very small distances and used to accurately measure the thickness or caliper of paper and paperboard. Also known as a caliper.

Middle Lamella: The intercellular region in the structure of wood fibres that provides strength and rigidity to the wood by holding the fibres together. The majority of the lignin in the wood is found in this region.

Middle (of Board): Furnish layer of a board situated between the two external furnish layers or between the underliners (*see* 'Underliner') or between an underliner and an external furnish layer.

Middles: A rough coarse board made from waste paper and mechanical pulp used as a filler or middle board in manufacturing triplex paste or ticket board. Middles white or coloured are also used as they are for bus and tramway tickets.

Midfeather: A partition located in the center of a beater chest or stock storage chest around which the pulp slurry is circulated to achieve fibre mixing and suspension.

Milk Carton Board: A grade of special food board which is strong, tough, usually plastic coated, and capable of being formed into a container for milk, cream, or other beverages. It is made of bleached pulp and the actual caliper depending on the type and size of the container.

Mill Blanks: Mill blanks are cylinder-machine products, generally consisting of top and bottom liner of white stock, vatlined on a filler of mechanical pulp, news or similar stock. Principal uses are for menus, posters, advertising cards, etc. Thicknesses such as 12 to 14 ply and heavier are usually made by pasting together two thinner plies, which are white on one side only with a news back. No. 1 mill blanks have liners consisting of bleached and unbleached chemical wood pulps, deinked paper stock and soft white shavings in varying amounts. The center is usually blank or printed news, though it may consist of mechanical pulp in the better grades. No.2 mill blanks are in general, characterized by being of poorer colour and quality and not as bright as the No.1 grade. The filler may be the same as that of No.1 mill blanks or as is more usual, it may contain a larger proportion of printed news.

Mill Boards: Heavy paperboards used for book binding, box making, carriage panels, shoes, etc. They are made from fibre refuse, waste paper, screenings, and mechanical wood pulp, the better grades may contain some hemp and flax fibres. The sheet is made on a vat machine and is calendered by passing several times through the board calender. They are hard, flat and non-warping.

Mill Brand: A line of papers, the names of which are owned by the mill manufacturing them.

Mill Cut: A term applied to the cut edge produced by the machine slitter or by cutters, as distinguished from that produced by a trimmer, which is smoother and in which the paper is more accurately cut.

Mill Edge: The slightly rough edge of untrimmed papers.

Mill Roll: A roll of paper as it comes from the paper machine, which is subsequently converted to smaller reels or to sheets.

Mill Size: A term used to denote a rosin size prepared at the mill for inplant use in paper manufacture. It need not be a true sodium rosinate soap.

Mill Wrapper: A general term to designate grades of paper used by paper mills for wrapping purposes. The grade depends on the quality of the contents to be wrapped and upon the custom of the mill (a) Heavy weight paper made of screenings, virgin pulp and for waste paper and used for wrapping paper mill runs or larger rolls and paper put into bundles. (b) Bogus or flexible paper board for the above purposes.

Millwide Control: Process control implemented throughout a mill.

Mimeo Bond: A grade of writing paper used for making copies on stencil duplicating machine. It is normally made of chemical pulps. It is characterized by good capacity, ink absorbency and freedom from lint, pulp, good printing, writing and mimeographing quality.

Mimeograph Paper: A grade of writing paper made from mechanical and/or mechanical pulps. It is used for stencil duplicating and usually differs from Mimeo bond in that printing and writing qualities are not as important as good mimeographing quality.

Mining Nozzles: High-pressure water jets located in the lower portion of a high-density pulp storage chests. They are used to provide dilution water so that the stock may be more readily pumped out. Mining water: The water used by these nozzles is termed as mining water.

Mitscherlich Pulp: A chemical pulp of the sulphite class characterized by relatively high hemicellulose content. Uses include glassine and greaseproof papers and specially papers where strength is a major requirement.

Mixbox: A tank on the inlet of a cylinder machine vat where make-up stock, drainage, and overflow white water are added and mixed. Also called a headbox.

Mixed Papers: A Grade of waste papers or paper stock not sorted or from which the better grades have been taken out. They are collected from department stores, offices, schools, etc.

Mixing Chamber: A compartment on some types of paper machine headboxes which extends across the

width of the paper machine and into which the manifold distributes stock furnish to achieve initial mixing and coalescence of the fibres.

Modified Aeration: A modification of the activated sludge process in which a shortened period of aeration is used with a reduced quantity of suspended solids in the mixed liquor.

Modified Starches: Starches which have been subjected to physical, biological or chemical treatment primarily to effect a change in their viscosity or chemical characteristics, or both.

Moist Pulp: Pulp with a moisture content considerably higher than the moisture content agreed for dry pulp.

Moisture Content: The amount of water in a material. In practice it is regarded as the ratio of the loss of mass of a test piece when dried according to the standard method of test to its mass at the time of sampling normally expressed as a percentage.

Moisture Proofness: The property of a high degree of resistance to the passage of liquid water and water vapour. In paper and paper board it describes a sheet with unusually low water-vapour permeability.

Molecular Weight: The sum of the atomic weight of all the constituent atoms in the molecule of an element or a compound.

Monitor: (a) A visual display, commonly on a video screen, of conditions and measurements occurring in the papermaking process. (b) To sense, record, or alert personnel to a process condition requiring attention, usually without the capacity of initiating corrective action.

Monorail Conveyor: Type of load-moving equipment guided by a single metal rail, used to transport paper rolls in paper mills. There are two types; the overhead and the in-floor.

Monosulphite Pulp: A pulp produced by a modified sulphite process commonly referred to as neutral sulphite so named because the cooking liquors are initially neutral in pH. Hardwoods are more responsive to this process than softwoods.

Monotype Paper: A white book paper to be perforated with small holes and used on a monotype keyboard and casting machine. It is also called key board paper.

Mordant: A substance which, when applied to fibre in conjunction with a dye, causes increased dye fixation.

Mother of Pearl Paper: A cover, book or decorative paper having an iridescent effect. This was formerly produced by various chemical recipes, for example, surface treatment of the sheet with silver, lead or other metallic salts followed by exposure to a gas such as hydrogen sulphide and fixing the iridescent effect with

a lacquer. Today, those effects are achieved by special printing techniques including use of fluorescent colouring materials.

Motor: Rotating equipment that converts fluid or electrical power to mechanical power to drive valves and machinery.

Motor Booster: An electric motor-drive generator placed in series in an electric circuit to change the circuit voltage.

Motor Control: An electrical motor that governs the electric power delivered and starts, protects, and maintains operational speeds of large motors in the mill.

Motor Control Center: The room in a mill where the electrical motor control equipment is located.

Motor Drive: An electric motor used in a mill machine drive system as the source of motive power.

Motor Generator Set: One or more motors coupled to one or more generators which serve as an electrical power system.

Mottle: An undesired pattern in printing caused by uneven absorption of printing ink.

Mottled Colour: Nonuniform colouring of a sheet of paper caused by irregularities in formation, calender pressure, dye application drying or plating.

Mottled Finish: A finish which is characterized by high and low spots or by glossy and dull spots.

Mottled Paper: A variegated effect produced on the surface of paper by the introduction of a small amount of heavily dyed fibres (mottling fibres) into stock of another colour. It is used for fancy and other effects.

Mottling: (a) Uneven dyeing of pulp fibres, caused by adding the dyestuff in a hot concentrated solution to the beater in such a manner as to colour a small number of fibres immediately, or by dyeing a mixed furnish in which certain fibres will fix the colour more quickly than the others. (b) Uneven dyeing of paper produced by addition of colouring mater in drops to the paper on the wire or to the dry paper after it has left the paper machine.

Mottling Effect: A variegated effect on the surface of paper produced by a local variation in the opacity of the paper caused by clumps of fibres.

Mold/Mould: A general term to describe a frame over which is stretched a porous fabric usually a wire screen, on which fibres are separated from a fluid suspension to form a sheet. There are several type (a) Cylinder mould. (b) For manufacture of moulded pulp products. (c) Sheet mould. (d) Hand mould.

Mould Made Paper: A deckle edged paper resembling that made by hand but produced on a machine. It is made on a cylinder of cylindrical mould revolving in a vat of pulp, the various sizes being arrived at by dividing surface with rubber hands to

imitate the thinning of the deckle edge of handmade paper or by cutting the web by means of a jet of water.

Moulded Pulp Products: Contoured products such as egg packaging cartons, food trays, plates, bottle protectors, etc. made by depositing fibres from a pulp slurry on to a perforated mould using either pressure applied to the slurry or a vacuum behind the mould and then drying the perform with heat.

Mounting Board: A paperboard upon which printed or lightographed sheets are pasted. It is made of reclaimed paper stock and is from 0.75 to 1.25 mm in thickness. It may be pasted to obtain required thickness. It has a high smooth finish and is stiff to resist warping.

Mullen: Bursting strength. So called from the name of the instrument used in the test.

Multi-Layer Paper or Board: Paper or board consisting of more than three furnish layers combined together during manufacture while still moist without the use of adhesive (See 'Furnish layer'). Two or more furnish layers may be of the same compositions.

Multimetal Plate: A lithographic printing plate composed of two or more metals, the image metal being preferentially ink-receptive and the non image metal being either preferentially water-receptive or easily desensitized to ink. Copper is the usual printing surface metal. The nonprinting metals are aluminium, chromium or stainless steel. The base plate may be copper but is usually iron or zinc with copper and chromium electroplated on it. Multimetal plates are used primarily for long runs or when printing with inks and paper that are unusually abrasive.

Multi-Ply: Made up of two or more plies. Depending on method of manufacture and use requirements, the plies may be firmly or partially bonded or completely unbonded.

Multicylinder Machine: A cylinder machine consisting of two or more vats arranged in tandem formation to facilitate the manufacture of thick papers, duplex papers, bristols, and filled boards.

Multigenerator Drive: A paper machine drive system where the various sections of the machine are driven by individual motors drawing their power from separate generators.

Multigraph: A machine designed primarily for reproduction of typewritten matter, although other type faces may be used. The principal part of the machine consists of a slotted revolving cylinder, the matter to be reproduced is set in type which is transferred to the slots of the cylinder. Impression may be made by a special typewriter ribbon or by an inking device, the paper passing between a rubber-covered platen and the ribbon or the ink type. Linotype slugs may be used in place of movable type; curved electrotypes may be also used. It is used principally for

business letters but may also be used for the preparation of reports, advertising matter, etc.

Multilith: The multilith is a small (offset) press suitable for office work. The plate may be prepared by typing directly on the plate, by drawing on it, or by photography. Multilith and Rotoprint are names of presses not the names of printing processes.

Multilith Paper: A printing paper designed for use on Multilith, Roto-print and other small offset presses.

Multipass Headbox: Type of headbox designed so that the stock flow reverses direction around a baffle as it travels to the outlet. It is typically used on high-speed newsprint machine.

Multipass Inlet: A type of flow distributor used to spread flow to the vat or a cylinder machine. Its length is designed to double back on itself two or more times as it is progressively reduced in size.

Multiple Branching Manifold: A type of stock furnish distributor used on the wet end of a fourdrinier paper machine. It is designed to be short-coupled to the headbox with a number of entry pipes.

Multiple-Effect Evaporator: A series of single effect evaporators so connected that the vapour from one effect is the heating medium for the next. At 100-percent efficiency, one heat unit would produce as many units as there are effects. This does not happen in practice; for example, a triple-effect evaporator may produce as much as 2.5 kg vapour per kg of steam used in the first effect.

Multistage Bleaching: A bleaching operation carried out in two or more stages. Many combinations of stages can be used, depending upon the characteristics which are needed in the finished pulp. The most common bleaching steps and their symbols are; Chlorination (C), Extraction with Sodium Hydroxide (E), Sodium or Calcium Hypo-chlorite (H), Chlorine Dioxide (D), Hydrogen Peroxide (P), and Oxygen (O).

Multiwall Corrugated Board: A corrugated board containing a multiplicity of corrugated members made by adhering one or more plies of single faced board to a double-faced board in such a manner that each corrugated member is lined on each side. In the case of double wall board, three liners and two corrugated members are combined into a single board of much greater strength than a double-face board of the same material will exhibit. The type or number of walls is designed in terms of the number of corrugated members.

Music Manuscript Paper: Paper printed with lines denoting the staff and used by musicians for writing musical scores. It is made from rag or bleached chemical pulp or mixtures of these. The paper is stiff enough to stand in a music rack has a surface that will take pencil or pen and ink. Erasability and good opacity are important characteristics.

Music Paper: A paper used to print or lithograph sheet music. It is made largely of bleached chemical pulp. The paper is well formed, has good opacity and is sized and processed to give a good opacity good pick strength and minimum curl. A flat good finish is desired and the paper must have stiffness to stand in a music rack.

Music-Roll Paper: A paper used for the manufacture of music rolls for playing pianos and organs. It is made from chemical pulp and may contain cotton or manila hemp fibre. The paper is resistant to change in dimension from the humidity of the air and gives clean perforations. Strength and resistance to abrasion are also important properties.

N

Napkin Papers: Tissue papers used in the manufacture of Paper napkins.

Napping: The process of raising the surface fibres on a papermaking felt by passing it against the rotating surface of a drum, fitted with barrel-shaped burrs (teasels), in order to produce a soft downy surface (the nap).

Natural Boiler Water Circulation: The movement of water in a power or recovery boiler caused by a force due to the specific weight differential of water and saturated steam at equivalent pressure.

Natural Coloured: A term applied to papers whose colours result from the nature of the stock used, with little or no colouring matter added.

Natural Draft: The negative pressure created by the height of a stack or chimney and the difference in temperature between flue gases and the atmosphere.

Natural Purification: Natural process occurring in a stream or other body of water that result in the reduction of bacteria, satisfaction of the BOD, stabilization of organic constituents, and replacement of depleted oxygen by exposure to air, sunlight and soil.

Needle Paper: A black wrapping paper free from such chemical matter which might cause rust or tarnish. It belongs to a class of papers variously termed, according to the use to which they are put, antitarnish, acid-free, black, cutlery, pin, etc.

Needled Felt: A paper machine press and dryer felt made by transversely punching and interlocking fibres in a loose mat with barbed needles thereby imparting the various combined properties of openness, finish and strength.

Negative Crown: The surface curvature of a paper machine roll when the center diameter is less than the end diameters, resulting in a concave surface profile.

Negative Paper: A paper normally used instead of photographic films or plates for making negative from which reproductions are made. It is cotton fibre content paper manufactured from high quality white cotton cuttings, heavier weight may be made for original or permanent use in (brown) prints not for reproduction purposes. The paper has a very hard surface, a smooth finish, good formation, and relatively low opacity. It is glue sized to contribute to its wet tensile strength and to minimise penetration of the photographic emulsion with which it is coated.

Net Positive Suction Head (NPSH): The amount above saturation pressure at the inlet of a boiler feedwater pump which should not be above saturation pressure to prevent flashing and pump damage.

Neutral Gummed Electrical Paper: These paper are used as sticker types and coil wrappers. Sulphate paper or fish paper coated with 12.7 to 25.4 μm of high grade, water-soluble animal glue are the usual combinations. For the kraft base material, thickness of 38 to 254 μm and for the fish paper base 127 to 254 μm may be used. The important properties are breaking strength, dielectric strength, freedom from metallic inclusions, uniform thickness and a neutral pH value. They are used in the manufacture of small electric coils and other electrical devices.

Neutral Kraft: A kraft paper with a pH of 7.0 and produced so as to be relatively acid and sulphur free. It is used in the textile industry where contact with wet materials precludes use of regular kraft which may give rise to staining and discolouration of textiles, in the stainless steel and aluminium industries and for manufacture of certain multiwell shipping sacks.

Neutral Size: A form of rosin size which is neither acidic nor alkaline in nature.

Neutral Sulphite Pulp: Pulp produced in a process where the active cooking agent is sodium sulphite, adjusted with sodium carbonate so that it is neither acid nor alkaline. Hardwoods are especially responsive to this form of pulping which results in pulp having relatively high tensile and bursting strength.

News Bogus Paper: A bogus paper made entirely from old newspapers.

News Vat-Lined Chip: A paperboard used for setup boxes and for general purposes. It is a combination board of chip, news lined on one or both sides. The board is stiff and has the clean appearance characteristic of news.

News Board: A paperboard used largely in the setup box trade. It is made on a cylinder machine from printed news, generally from 0.4 to 44 μm in thickness and is stiff with a surface of clean appearance such as is required for the better grades of boxes: (a) Combination newsboard is a board having a news base or centre and lined on one or both sides with a higher

grade of stock. (b) Solid newsboard is a board made with a entirely from printed news.

Newspaper Wraps: A strong unbleached or semi-bleached kraft wrapping sheet used for wrapping newspapers and magazines in mailing. Desirable properties are strength, sizing and scuff resistance.

Newsprint: A generic term used to describe paper of the type generally used in the publication of newspapers. The furnish is largely mechanical wood pulp, with some chemical pulp. The paper is machine finished and slack sized and it has little or no mineral loading. The term includes standard newsprint and also paper generally similar to it and used for the same purpose but which may exceed to slight degrees the limitations of grammage, finish, sizing, and ash applicable to standard newsprint.

Newsprint Sheets: Newsprint paper in sheet form as contrasted to roll news. The sheets are used in printing many weekly newspapers on flat-bed presses.

Newtonian Fluid: Fluid in which the sheet stress is directly proportional to shear rate and viscosity remains constant when the rate of shear is changed.

Nip: The contact area between two rolls on pulp and papermaking machines, such as wet presses, coaters, calenders, supercalenders, etc.

Nip Pressure: The pressure between two vertically aligned rolls as in a wet press of a paper machine, expressed in kg force per linear cm or kilonewtons per linear meter roll face, and determined by the sum of any mechanical loading and weight of the top roll in kg, divided by the length of the contacting face at the nip.

Nipple: A short length of pipe or tube used for joining piping elements together.

Nitrating Paper: A waterleaf sheet prepared for use as the raw material in the manufacture of the very highest grades of nitrocellulose (intended for conversion into films, lacquers, celluloid, etc) where clarity, cleanliness, and freedom from colouring matter are of special importance. The paper is made from new white cotton cuttings, cotton linters or from highly purified wood pulp (cellulose nitrate chemical conversion grade). It may be made on a fourdrier or cylinder machine, and may or may not be calendered, according to the requirements of the converter.

Nitrogen Dioxide (NO_2): A compound produced by the oxidation of nitric oxide in the atmosphere; a major contributor to photochemical smog.

No-Sulphur Pulping: The process of chemically reducing a raw material into its fibre components with a cooking liquor consisting of chemicals that do not contain sulphur.

Nodules: A form of pulp prepared by dewatering a slurry to approximately 35 percent air dry and shredding. It is used primarily for storage and

transportation. The method of preparing this form of pulp is commonly called nodulizing.

Nodulizing: See 'Nodules'.

Noiseless Paper: Paper used in any place where the rustle or rattle of paper is objectionable, such as for theater programs, radio manuscripts, paper pillowcases, etc. Such papers cannot be limited to any specific grades as any paper can be treated to eliminate noise caused by rattling.

Nominal Mass: (a) *Paper*—The mass stated or prescribed for paper usually in kilograms per ream of 500 (or 480) sheets of given size and grammage. (b) *Board and paper boards*—The mass stated or prescribed for a board or paper board usually in kilogram per pack of 144 sheets (or 100 sheets) of given size or grammage.

Non-newtonian Fluid: Fluid in which the shear stress is not directly proportional to the shear rate, and the viscosity does not remain constant when the rate of shear is changed.

Non-rust Paper: Paper rendered free from chemical products liable to rust ferrous metals.

Non-tarnish Paper: Paper rendered free from chemical products liable to tarnish metallic articles.

Non-combustible Paper: Special type of paper, usually made with asbestos, ceramics, or glass fibres, which will not burn or support combustion. It is used for fire-protection purposes.

Non-condensibles (NCs): A pulp mill term referring to gases which if not removed or relieved properly, collect at the top of a batch digester and cause a false pressure that prevents the temperature from rising to the proper cooking levels.

Non-contact Evaporator (NCE): Type of evaporator in which the evaporating medium (steam or hot gases) does not contact the liquid being evaporated, such as used to concentrate black liquor with hot exhaust gases in a recovery furnace.

Non-curling Gummed Paper: A gummed paper which has been treated to prevent curling. Gummed paper has a strong tendency to curl because of the unequal expansion and contraction of the gum and the paper with humidity changes. In noncurling paper the gum has been broken into small particles after drying so as to present a discontinuous surface.

Non-fading Poster: An offset-type printing paper designed for billboard use. It is usually made from chemical pulps and light-fast dyestuffs.

Non-inductive Load: The type of load on an electrical system or equipment in which the current is in phase with the voltage across the entire load.

Non-wood Pulp: Paper making pulp made from new materials such as bagasse, bamboo, esparto, straw,

cotton, etc, not manufactured from pulpwood trees, but from other fibrous plants.

Non-woven Fabric: A sheet of cloth-like material made from long natural and synthetic fibres. It is formed from a slurry on a wire screen such as a wet end of a paper machine, or by laying on a fine mesh screen from an air suspension.

Note Paper: Writing or tablet paper usually folded. There is quite a wide range of quality and finishes used.

Notebook Paper: Strictly speaking, any paper used for various types of notebooks whether bound, loose-leaf, spiral-wound or otherwise. Normally however this term is applied to a well-sized bond or tablet-type chemical pulp writing paper which is converted into various items such as punched, ruled, and edge-reinforced cut size.

Novel Paper: A Grade of paper once predominantly used in 'Pulp' magazines but now primarily used in pocket-sized paperback novels and in children's colouring books. It is made from approximately the same fibre furnish as newsprint in such a way as to produce a rough surface and maximum bulk. CTMP and TMP pulps are preferred as they possess more strength and durability. Thicknesses range from a minimum of 102 μm as high 140 μm compared with 76 μm for newsprint.

Noxious Gases: Objectionable gases such as those contained in the flue gases of a sulphate pulp mill. They consist mainly of sulphur dioxide (SO_2), nitrogen oxides (NO_2) and total reduced sulphur (TRS), made up of hydrogen sulphide (H_2S), methyl mercaptan (CH_3SH), Dimethyl sulphide (CH_3SCH_3), Dimethyl disulphide (CH_3SSCH_3) etc.

Nozzle: A tapering, constriction in a pipeline, projection, or spout used to increase the velocity of the fluid flowing through it.

Nozzle Headbox: Type of paper machine headbox designed with nozzle-like inlets, with the entire channel from the pump to the slice completely filled with stock.

Nozzle Slice: A type of paper machine slice, with a nozzle-like design, which operates entirely filled with stock.

Nuclear Gauges: Measurement instruments having radioactive sources as the primary element. They are used to measure level, density and basis weight in pulp and paper mills.

Number 1 Manila: A kind of wrapping paper, pale straw in colour, which is made wholly or principally of chemical pulps.

Nutrients: Elements or compounds essential as raw materials for organism growth and biochemical development; for examples, carbon, oxygen, nitrogen, and phosphorus.

O

Oatmeal Paper: A terms used to describe a grade of hanging paper in which fine sawdust is added to the furnish to give the sheet a coarse effect.

Obsterical Sheet: A soft, waterproof, sanitary paper, used as the name implies to replace a rubber sheet. It may be plasticized, waxed or parchmented and possesses high wet tensile strength.

OCR Paper: Generally high quality writing paper suitable for optical character recognition printing, generally used for making security bonds and cheque papers.

Odd: Not in accordance with regular or standard sized, weight, finishes, colours, etc.

Odour Control: A process for removing objectionable smelling substances from industrial operations by either mechanical or chemical means.

Odour Abatement: The technology of reducing the nuisance caused by disagreeable odours of waste gases from pulp mills.

Odour Threshold: The point at which after successive dilutions with odourless water, the odour of a water sample can just be detected. The threshold odour is expressed qualitatively by the number of times the sample is diluted with odourless water.

Off Colour: Not matching the colour of the sample or specification.

Off Square: Cut or trimmed so that two or more corners of the sheet deviate from a 90° angle.

Offcut: In making paper, it is not always possible to make the size required without waste, so frequently a sheet of an alternative standard size is cut from the waste. These sheets are termed offcuts. The expression is also applied to remainders of reams which have been cut down to a smaller size.

Offset: A technique in printing by which the ink images are transferred from the plate first to an intermediate rubber blanket and then to the material being printed. This technique, which reduces plate wear and permits printing on rougher material, is most commonly associated with lithographic printing. For this reason the word 'Offset' alone is sometimes used to indicate offset lithography.

Offset Blotting: A duplex commercial blotting with surface intended for printing by the offset lithographic process.

Offset Bristol: Any bristol that has been specially sized for offset lithography.

Offset Cartridge: A special variety of hard-sized and strong paper, generally free from loading and usually with a matt surface, with dimensional stability and suitable for offset printing.

Offset Lithography: An adaptation of the principles of stone (or direct) lithography, in which the design is drawn or photographically reproduced upon a thin flexible metal plate which is curved to fit a revolving cylinder. The design from this plate is transferred to or offset onto a rubber blanket carried upon another cylinder, which in turn transfers the design to the paper, cloth, metal, etc.

Offset Paper: An uncoated or coated paper designed for use in offset lithography. The kind, type and combinations of pulps used in its manufacture depend upon the sheet qualities desired. Important properties are good internal bonding, high surface strength, dimensional stability, lack of curl, and freedom from fuzz and foreign surface material.

Offset Postcard: A bristol or cardboard, made of bleached chemical pulps, with a kind of vellum finish and used for postcards, or special jobs where it is desired that work will stand out and still show a soft finish.

Offset Printing Paper: A hard sized paper processing good physical strength, surface strength, dimensional stability. The paper must be clean and free from fuzz and suitable for offset single or multicolour printing (also called Offset Paper, Offset Cartridge and Offset Printing).

Offshade: Adjective applying to a paper or board the colour of which does not confirm to an agreed specimen.

Ohm: A unit of resistance offered to the passage of 1 ampere when impelled by 1 volt.

Oil Burner: A device used to inject and atomize fuel oil into fine sprays, proving for proper air mixture on combustion in a furnace. Also referred to as oil gun.

Oil Proof Paper: A specially treated paper which resists penetration by oil, such as vegetable parchment paper and greaseproof paper.

Oiled: Treated with any kind of oil; the type of oil depends on the intended use.

Oiled Offset Paper: An oiled jute and kraft paper used in printing processes for the prevention of offset from freshly printed pages.

Oiled Paper: (a) A strong paper treated with boiled linseed oil, or a mixture of oil and turpentine. Its chief use is in copying letter books. (b) Thinner papers generally manila wrapping saturated with a neutral mineral oil, used for packaging purposes.

Oiled Tracing Paper: A tracing paper in which the transparent properties are secured by impregnating it with oil.

OK Sheet: (a) A proof sheet against which press sheets are compared to determine when make ready is completed and the press run may begin. (b) An okayed press sheet.

On-Line: The type of operation of a computer and other instruments that is actively monitoring and controlling a process or operation.

On-Machine Coating: The process of applying coating on paper or board while it is being manufactured in a paper machine. It is generally done either at calenders or at size press.

One Side Finish: Paper finished or decorated on one side only.

One Time Carbon Paper: A paper made of chemical pulp or mixture of chemical and mechanical pulp which is coated with carbon and used with manifolded forms.

Onionskin Paper: A lightweight writing in 25-30 gsm range paper used primarily for making carbon copies of typewritten matter. It is usually made from chemical pulp with or without cotton pulp and in smooth, glazed, plated, supercalendered or cockle finishes.

Opacified Bond Paper: A grade of writing or printing paper originally used where strength, durability and permanence are requirements and which contains an opacifying agent.

Opacified Book Paper: An uncoated paper in the manufacture of magazines, books, pamphlets and brochures and which contains an opacifying agent.

Opacifier: A compound added to paper during its manufacture to reduce the translucency of the sheet.

Opacimeter: An optical paper mill laboratory instrument with which the degree of light transmission through a sheet of paper can be measured.

Opacity: The property of a sheet that obstructs the passage of light and prevents seeing through the sheet objects on the opposite side. This property is especially important for printing papers. It is the ratio expressed as a percentage of the amount of light reflected from a single sheet of paper with a black backing to the amount of light reflected from the same sheet of paper backed by an effectively opaque pile of the same paper, measurements being made under standardized conditions.

Opacity Book Paper: Usually a lightweight book paper made to have maximum opacity for a given thickness or weight.

Opaline: A very smooth and greasy finish obtained with a percentage of loading, usually talc added to the pulp.

Opaque: The property of being impervious to light and non-transparent.

Opaque Circular Paper: A term sometimes applied to writing or book paper with more than the ordinary opacity features.

Opaque Paper: Paper that has been manufactured to have more than ordinary opacity for a given grammage, thickness, etc.

OPCO Process: A wood pulping process in which pulp produced by mechanically separating the fibres of preheated chips in a pressurized refiner, known as thermomechanical pulp (TMP), is treated with sodium sulphite before further refining.

Open Consistency Regulator: A type of consistency regulator whose sensor consists of an element in an open flow box with provisions for stock inlet, outlet, and overflow.

Open Impeller Pump: A type of centrifugal pump designed with widely spaced impeller blades and used extensively to handle heavy pulp and stock slurries in a mill.

Open Transfer: A means of transferring the wet sheet web from the wire section to the wet press of a paper machine, and includes open draw and poor man's pickup.

Open Washing: A type of pulp washing sequence used in multistage bleaching of pulp in which the wash water is drained as effluent.

Optical Bleaching: Incorporation in the pulp or paper of an almost colourless substance that can convert ultra-violet light into visible light in order to improve its apparent whiteness.

Optical Brightness: Fluorescent dyes or pigments that absorb ultraviolet radiation and re-emit it at a higher frequency in the visible spectrum (blue), thereby effecting a white, bright appearance to the paper sheet added to the stock furnish.

Optical Properties: Those properties of pulp, paper, and paper board that are associated with light absorption and light-scattering.

Orange Peel: A pebbled surface similar to the skin of an orange in texture.

Order Blank Paper: A term used to describe the sheet of paper frequently enclosed with advertising pieces and catalogues. The sheet is sized for pen and ink writing, has a smooth hard surface for printing and writing, and is strong enough to withstand considerable usage. A variety of grades is commonly used including bond, tablet, manilas and maplitho paper. It is usually supplied in various light colours. When used in multiple forms where carbon copies are desired, it is known as sales-book paper.

Organic Felt: A felt made from rags, wood fibre or paper. It is distinguished from mineral felt such as asbestos.

Orifice Plate: One of the most frequently used primary devices in the paper industry for flow measurement of fresh water, steam, clean chemicals, and uncontaminated gases. It consists essentially of a thin gauge metal plate installed in a pipeline. It has a characteristically shaped and located hole in it to produce a differential pressure as the fluid flows

through it. This differential pressure is measured and converted into flow values.

Orsat Apparatus: A test instrument used in many mills to determine the percentage composition of selected components in a gas mixture, flue gases, etc., by using the proper reagent for the component like CO, CO₂, O₂, SO₂, etc., to be measured.

Osmosis: The tendency of a fluid to pass through a semi-permeable membrane into a solution where the concentration is lower.

Out of Round: Having a flat area on the roll, often with a starred pattern at the end of the roll, sufficient to cause 'Humping' and excessive vibration of the web during conversion or printing.

Outfall: The mouth of conduit drains and other conduits from which a mill effluent discharges into receiving waters.

Outside Chip Storage (OCS): A method of storing chips in open piles and feeding them from there directly to the digester house.

Outturns: Samples which represent the paper made on different runs of the paper machine; they are kept by the mill and may be sent to the customer.

Outward Flow Screen: A type of rotating cylindrical stock screen designed so that the direction of flow is from the inside to the outside of the screen plates. The accepted fibre passes through and the oversize and dirt particles settle and are continuously drawn off.

Ovendry: Containing practically no moisture. A paper or pulp is said to be ovendry when it has been dried in an oven at 105°C ± 3°C until its weight has become constant within 0.1 percent.

Overcook: A pulping cycle or procedure in which pressure, temperatures, liquor concentrations or fibre factors are in excess of nominal, thus yielding weak and hard-to-bleach pulps.

Overdried: A term applied to paper which has been excessively dried with a resulting increase in brittleness and a loss of inherent strength.

Overfire Air: Combustion are fed into a furnace just above the stoker grate.

Overissue News: Newspapers which have been printed but not circulated by the publishing plant, hence clean and uncontaminated; distinguished from folded news (unsold newspapers from newsstands) and crumbled news (newspapers segregated from waste gathered from other sources).

Overlay: A piece of paper put on the tympan of a printing press to give more impression to a letter, line, or engraving.

Overlay Paper: A high purity paper for impregnation with a synthetic resin and molded as the top layer of a decorative laminate. The treated overlay paper becomes substantially transparent during the molding

procedure and gives added protection to the underlying layer.

Overrun: A quantity of paper made in excess of the amount ordered. Trade custom allows to a certain tolerance for overruns and underruns.

Oversize: (a) Paper made to allow for trimming to the size ordered. (b) Paper larger than ordered.

Overweight: Heavier than ordered or specified.

Oxidation Lagoon: A holding pond in which mill liquid effluents are retained in order that oxygen may be added by the use of air mechanically or by natural means so that biological oxidation of organic materials takes place.

Oxidation Pond: A basin used for retention of wastewater before final disposal, in which biological oxidation of organic material is effected by natural or artificially accelerated transfer of oxygen to the water from air.

Oxidation Reduction Potential (ORP): The voltage developed in chemical solutions when oxidation reduction reactions take place. It is used to determine residual chlorine in the chlorination of pulp, water, and the manufacture of hypochlorite bleaching solutions in a pulp mill.

Oxidation Treatment: The process whereby through the agency of living organisms in the presence of oxygen, the organic matter contained in wastewater is converted into a more stable or mineral form.

Oxygen Balance: (a) The dissolved-oxygen level at any point in a stream, resulting from the opposing forces of deoxygenation and reaeration. (b) The relation between the biochemical oxygen demand of a wastewater or treatment plant effluent and the oxygen available in the diluting water.

Oxygen Bleaching: A process of bleaching pulps, involving the use of oxygen in an alkaline medium to reduce lignin and other dark-coloured components. This process reduces the overall level of bleaching chemicals and lowers the biological oxygen demand of the effluent.

Oxygen Demand: The quantity of oxygen utilized in the biochemical oxidation of organic matter in a specified time, at a specified temperature and under specified conditions.

Oxygen Scavenger: Chemical materials used in boiler feedwater conditioning to aid in the removal of low level dissolved oxygen to decrease its corrosive effect.

Overwrap: A complete wrapping over one or more packs.

One-Piece Case: A fibreboard case, with one manufacturer's join, constructed as a complete (sleeve) top and bottom, each being formed by four flaps. The inner flaps may meet or have a gap between

them which the outer ones may meet or overlap either partially or completely.

P

P.O.S. Computer Paper: A term usually applied to small rolls of paper used on electronic cash registers for 'Point of sale' recording of business transactions. Such rolls may be of single copy construction (bond or tablet base stock) or multi-copy (carbonized carbon-interleaved, or carbonless). P.O.S. computer paper is also available in fanfolded makeup.

Packing Paper: A general term applied to any paper used for packing purposes.

Pad: (a) Paper sheets glued on one side to make up a small writing packet. (b) Protective sheets of cut-to-size corrugated or solid paperboard used inside shipping containers to separate the contents.

Pallet: A pallet is a light, low platform constructed of wood or other suitable material such as solid or laminated paperboard on which various materials (for example paper and paper board) can be loaded and fastened for shipment. A pallet usually consists of two platforms held apart by posts (instead of runners as in a skid) firmly affixed thereto both top and bottom and so arranged that the load can be transported by fork lift truck through entry at either side of end. Its advantages over a skid are its lighter weight (with attendant lower freight costs) and ease of handling and stacking. There are many simplified variations of construction, for example single sheets of paperboard with ends bent upward sufficiently to allow insertion of the lift truck fork.

Pamphlet Cover: Cover papers made of varying quantities of cotton fibre and chemical pulp in various thickness, colours, designs and finishes. They are used to cover pamphlets, booklets, catalogues, and the like, which are saddle stitched but not sewn.

Pamphlet Paper: Any uncoated or coated printing paper used for pamphlets.

Paper: A generic term for a range of materials in the form of a coherent sheet (*see* 'Sheet') or web (*see* 'Web') — excluding sheets or laps of pulp as commonly understood for papermaking or dissolving purposes and nonwoven products-made by deposition, of vegetable, mineral, animal or synthetic fibres, or their mixtures, from a fluid suspension onto a suitable forming device, with or without the addition of other substances. They may be coated, impregnated or otherwise converted, during or after their manufacture, without necessarily losing their identity as paper. In conventional papermaking processes, the fluid medium is water; new developments, however, include the use of air and other fluids.

NOTES

1 In the generic sense the name 'Paper' may be used to describe both paper and board as defined (*see* 'Paper and Board').

2 For some purposes, materials of grammage less than 180 g/m^2 are considered to be paper, and materials of grammage of 180 g/m^2 or above are considered to be board (*see* 'Board').

However, distinction between paper and board is primarily made on the basis of the characteristics of the material and in some cases its use. Many materials of less than 180 g/m^2 such as certain grades of folding box board and corrugated raw materials are generally referred to as 'board' and many materials of grammage greater than 180 g/m^2 generally referred to as 'paper' such as press pahn, kraft, cover paper, maplitho, etc.

Paper Additives: Materials that are added to paper and paperboard to provide special end-use characteristics, such as wet strength resins, fungicides, plasticizers, flame retardants, water repellents, antimycotic agents, antioxidants, etc.

Paper Base Laminate: The product obtained by impregnating or coating a paper with a thermosetting resin solution, and drying and pressing a number of layers of the treated paper until the resin is fully cured. Decorative laminates are used for counter and table tops, wall coverings, etc. Industrial laminates are used for gears, refrigerator inner doors, etc. A given product may contain more than one kind of paper with different quantities or kinds of resins.

Paper Board: One of the two broad subdivisions of paper (general term) the other being paper (specific term). The distinction between paperboard and paper is not sharp but broadly speaking, paper board is heavier in basis weight generally above 180 g/m^2 thicker, and more rigid than paper. There are a number of exceptions based upon traditional nomenclature.

Paper Clay: A white or light-coloured clay, very low in free silica. The term usually refer to kaolin. Most paper clays as marketed have been beneficiated to attain properties requisite for filling or coating use.

Paper Cloth: Cloth-like fabric sheet material made with paper which has been woven from twisted paper threads, cloth with paper lining on one or both sides, or any type of specially treated paper that is used as a substitute for cloth. It is used for such purposes as household cleaning and book-binding. Sometimes known as paper textiles.

Paper-Mache: (a) A molding material made from virgin pulp or more typically from repulped paper stock to which glue or other adhesive has been added. It is used for a variety of articles of merchandise, models, relief maps, etc. (b) A lightweight product molded from the above material to which linseed oil, varnish, lacquer or other protective or decorative finish has been applied after drying. Also called 'Papier Mache'.

Paper Machines: See under specific machine like Cylinder machine, Fourdrinier machine, Harper machine, Inverform, Wet machine, Yankee machine, Bel Bai, Retoformer, Twinewire machine etc.

Paper Napkins: Special tissues, white or coloured, plain or printed, usually folded, and made in a variety of sized, for use during meals or with beverages. Single ply napkins, usually embossed.

Paper Specks: In paper made from reclaimed stock, undefibred pieces of the reclaimed paper also called stock lumps.

Paper Stock: Waste papers, specifically such material sorted or segregated at the source into various recognized grades such as No. 1 news, new kraft, corrugated cuttings. Old corrugated containers manila tabulating cards, coated soft white shavings, etc. It is used as a principal ingredient in the manufacture of certain types of paperboard, particularly boxboard made on cylinder machines where the lower grades may go into filler stock, and the higher grades into one or both liners. Selected grades are also used in the manufacture of various papers.

Paper Textiles: A general term descriptive of various fabrics made of paper which has been twisted into yarn and then woven or knitted.

Paper Waste: In printing, that paper consumed which does not become part of a good product. Common subcategories include: (a) White waste—that part of consumed paper (not including wrappers) which has not been printed, such as that remaining on the core of a roll when it is removed from a reel (core waste). (b) Printed waste—all printed paper that does not leave the pressroom as work inprocess. (c) Handling and transit waste—in web printing (especially newspaper), all paper (not including wrappers) taken from a roll before the paper is started through the press (part of white waste). (d) Makeready waste—in web printing, that part of the paper printed after startup until the moment that okay signatures or sheets are achieved (part of printed waste). (e) Run or running waste—Paper printed after okay signatures or sheets begin but that does not leave the press room as good work in process (part or printed waste).

Paper Sizes: Paper sizes are generally of two categories: (a) Untrimmed which indicate the size of the paper sheet or reel as it comes out from the cutting machine in the paper mill. (b) Trimmed sized when paper sheets are guillotined to achieve exact size of the paper sheet with 90° angle of each corner.

1) Earlier British scales were used in Paper Trade with following measures of untrimmed sheets.

Foolscap $13\frac{1}{2}'' \times 11\frac{1}{2}''$ and $13\frac{1}{2}'' \times 17''$

Double Foolscap $16\frac{1}{2}'' \times 26\frac{1}{2}''$ and $17'' \times 27''$

Demy (sheet) $17'' \times 21''$

Demy $18'' \times 22''$ and $17\frac{1}{2}'' \times 22\frac{1}{2}''$

Royal $20'' \times 25''$ and $20'' \times 26''$

Imperial $22'' \times 30''$

Double Demy $22'' \times 36''$ and $22\frac{1}{2}'' \times 35''$

2) Presently the national standard IS 1064 prescribes the following sizes:

For all kinds of stationary and printed matter, shall have A-series sizes, starting from 4AO size 1682 mm \times 2378 mm and consequently having the sheet from first half (2AO) being 1189 \times 1682 mm, to second half, third half and so on to 13th half being A-12 size of 13 \times 18 mm size.

Besides A series, IS 1064 also refers to special sizes in 'B' or 'C' series.

Paper, Metal-Coated: Paper coated with metal powders.

Paper, Metallic: Paper to which metallic tints have been given.

Paper, Mat-Coated: A dull mat finish coated paper produced on a roll or brush coating machine. It is used for box coverings, labels, greeting cards.

Papeterie: A chemical pulp and cotton fibre content paper, made especially for conversion to a class of writing types. It is usually appropriately treated, decorated, cut, and packaged for use as correspondence stationery.

Paraffin: A white waxy substance obtained from petroleum. It is commonly used as waterproof coating or laminant in the paper industry.

Paraffin Paper: Paper treated with paraffin wax to render it waterproof.

Parallel Laminated: A laminate in which all the layers of material are oriented approximately parallel with respect to the grain or strongest direction in tension.

Parchment: A sheet of writing material prepared from the skins of goats, sheep, and other animals. See Vegetable Parchment and Parchment Paper.

Parchment Bond: A parchment like writing paper used as to substitute for animal or vegetable parchment for bonds, posters, deeds, etc. It is high quality sheet, tub sized, and left, air, or machine dried. Durability, toughness and velvet surface are significant properties. See 'Parchment Paper'.

Parchment Deed: (a) A well-hydrated bond paper with the appearance of parchment. (b) See Document Parchment.

Parchment Finish: A finish resembling genuine parchment, produced in a plated by bunched plating. This finish is obtainable only with a very hard paper. The surface is smooth but uneven and has little glare.

Parchment Paper: A strong high quality paper made from chemical pulps with laid lines with medium

finish, hard sized, used for writing printing. *See also* 'Imitation Parchment and Parchment Bond'.

Parchment Tracing Paper: Tracing paper in which the transparent properties are obtained by parchmentizing with chemicals, such as sulphuric acid, or by prolonged beating or refining.

Parchmentizing: (a) Chemical process—The treatment of unsized cotton or purified chemical pulp paper by sulphuric acid or other chemicals under controlled conditions to produce vegetable parchment paper. (b) Mechanical process — The beating of sulphite or sulphate pulp of the proper quality for a sufficient time under controlled condition to produce a pulp suitable for greaseproof paper.

Parenchyma: Any tissue of thin walled living cells. These cells closely associated with the resin canals, the ray tissue in the softwoods, and with the vessels and the ray tissue of hardwoods. In the living bark tissue they form an important part but in the dead bark in their collapsed state, they are only located with difficulty. In a physiological sense, they are necessary for the normal functioning of specialised tissues, and in addition, they are frequently storage tissues containing active or inactive metabolic materials. The active materials include starch, fats, oils, and resins and the inactive include tannins, quinones, alkaloids, etc, and salts such as carbonates and oxalates. Cooking and bleaching treatments separate parenchyma cells from one another but unless the treatments are vigorous, their contents usually remain.

Particle Board: A rigid board consisting of small discrete particles of wood or similar material combined with a synthetic resin adhesive and bonded or cured under controlled heat and pressure. Customarily made in thicknesses of 6.35 to 25.4 mm.

Particle Size Distribution: The percentages expressed in terms of weight of the various sizes of particles in a powder sample when classified in terms of size ranges and measured in terms of screen mesh or micrometers.

Particulates: Finely divided solid or liquid particles in gaseous emissions from various areas of a mill, including chemical droplets dust, mists, fogs, fumes, and smoke.

Parts Per Million (PPM): The unit commonly used to represent the degree of pollutant concentration where concentrations are small. Larger concentration are expressed in percentages. However in SI units the preferred units are mg/kg or mg/l.

Passivity: The corrosion-resistant property of metals or alloys used in the paper industry, such as titanium, due to the formation of a protective film, such as oxides, on its surface.

Pasted: Formed of two or more layers (which may or may not be of the same stock) that have been pasted together as a separate operation from their manufacture on the paper machine.

Pasted Board: Board produced by pasting two or more formed papers with an adhesive in a subsequent operation as distinct from the material produced by pressing together in wet state without the use of an adhesive.

Paster: A machine for pasting two or more sheets together, either in a continuous roll or as separate sheets.

Pasting: The process of uniting, by means of an adhesive, two or more sheets of paper or paperboard, paper to board, or coated or offset paper to blotting paper. Paper may be pasted off the reel or in the web (roll machine) or in sheets (sheet-pasting machine).

Patch Mark: A watermark made with a wire mark patch sewed into the wire of a mould on a cylinder machine or into a dandy roll or a fourdrinier machine.

Pattern Fibre: A grade of vulcanized fibre having high dimensional stability and resistance to warping. Its principal use is as patterns in cutting cloth, leather, and other materials. It is made in thicknesses from 0.76 to 1.52 mm usually in black gray and red colours.

Pattern Paper: Paper used by designers and tailors for the making of patterns ranging in thickness from 0.178 to 0.864 mm. The surface is suitable for pencil or rayon markings. The furnish is usually kraft but may contain hemp stock, depending upon the strength required. The paper, manufactured in a variety of colours, is sometimes referred to as X paper.

Peak Power: A power plant and user mill expression referring to the average power during a time interval of specified duration occurring within a given period of time, with the intervals being selected when the average power consumption is the greatest.

Pearl Filler: Anhydrous calcium sulphate used as a filler in papermaking. It occurs naturally as anhydrite or may be obtained by dehydrating Gypsum.

Pearl Starch: Unmodified cornstarch in the form of small granules, as contrasted with powdered starch. The term was originally used more broadly to describe starch in granular form.

Penetration of Ink Vehicle: (a) The process by which vehicle is absorbed from a printed ink film into the printed material causing the ink film to set. (b) The ability of an ink vehicle to penetrate or be absorbed by a paper surface.

Percent Wet Tensile: The tensile strength of a paper when thoroughly saturated with water, expressed as a percentage of the air dry tensile strength of the same

paper. The percent wet tensile of waterleaf paper is of the order of 5 percent which may be increased to 30 percent or higher by treatment with wet-strengthening agents.

Percent Active Time: The ratio, in percent, of the actual operating time of a piece of machinery in a mill to the theoretical time operation if no unforeseen circumstances, to prevent its operation were encountered.

Percent Solids in Black Liquor: The percentage of solids by mass in black liquor fluid in a recovery system in a sulphate pulp mill. For example, if black liquor to a recovery furnace is 70 percent solids, then 30 percent is water.

Perfect: A term applied to paper free from defects.

Perfect Reflecting Diffuser: Ideal uniform diffuser with a reflectance equal to unity.

Perforating Paper: A paper which will give clean-cut edges on punching.

Perforations: Punching lines of small holes or slits in a sheet so that it may afterwards be torn off with ease.

Perforator Tape: A converted paper product in small roll or fan-folded form used for communications equipment, automatic machinery, business machines, typesetters, etc. Such tape is perforated (that is 'Punched') in use and these perforations transmit appropriate signals to actuating mechanisms, etc. Perforator base paper is usually made from chemical pulps to exacting specifications, the most important being uniform caliper, freedom from grit and mineral fillers, high tensile strength, clean perforating ability, and good oil receptivity. Perforator tape may be oil-treated (usually from 12 to 22 percent mineral oil content by weight) or plain.

Periodical Publishing Paper: See 'Coated magazine paper'.

Peripheral Speed: The surface speed of any rotating, cylindrically shaped piece of papermaking equipment such as a pulpstone and a dryer drum. It is expressed in meters per minute or sometimes in feet per minute.

Permanence: The permanence of paper refers to the retention of significant use properties, particularly folding endurance and colour, over prolonged periods. The permanence is affected by temperature, humidity, light, and the presence of chemical agents. The probable permanence of paper is estimated by an accelerated oven-ageing test or by tests under other specified conditions of temperature, light and humidity. The evaluation of permanence is based on measurement of folding endurance, resistance to water penetration, colour, solubility in aqueous alkaline solutions and viscosity of a solution of the fibres in a cellulose solvent.

Permanent Paper: Paper made to resist the effects of ageing to greater degree than is usual in other papers. Usually acid-free, such paper is used for archival or artistic purpose.

Permanent Record Paper: Paper intended for use in legal records, documents art work and library books of permanent value, which are expected to last for many decades without severe deterioration.

Permanganate Number: A value, also known as K number, that indicates the relative hardness or bleachability of chemical pulp usually having lignin contents below 6 percent. It is determined by the number of millilitres of one-tenth normal potassium permanganate solution (KMnO_4) that is absorbed by 1 gram of oven dry pulp under specified and carefully controlled conditions (See K. No.)

Permeability: A measure of the property of a paper or board which allows penetration from one surface to the other by a fluid. It is preferable to use the term 'transmission rate' rather than permeability of this property. Though dependent on porosity of the paper or board, there is no correlation between the two.

Peroxide Bleach: A bleaching chemical made with sodium or hydrogen peroxide and used to bleach pulps, mechanical, semichemical or chemical grade.

Peroxide Bleaching Stage: A sodium or hydrogen peroxide bleaching step or steps sometimes used in the later part of the multi-stage chemical-bleaching sequence as one of the operations making up the complete pulp-bleaching system.

Persuader: A length of pipe or an extension handle used on a wrench to get greater leverage. Also called a hickey.

pH: An expression of the hydrogen-ion concentration, and thus a measure of the acidity or alkalinity, of an aqueous solution. The pH value is the negative logarithm, to the base ten, of the hydrogen-ion concentration. A pH of 7 represents a neutral solution decreasing pH value below 7 represent increasing acidity, and increasing values above 7 represent increasing alkalinity. The pH values of hot or cold aqueous extracts are empirically correlated with properties of paper such as its permanence, its reaction with the fountain etch in offset printing and others.

Phloroglucionol: An acidified chemical solution of which is commonly used in the trade for detecting the presence of lignin which gives a distinctive pink/red coloration in the paper containing mechanical wood pulp. It loses its efficiency on exposure to day light.

Phloroglucine: A chemical compound, dissolved in alcoholic any hydrochloric acid, is used as a reagent to detect the presence of mechanical wood fibre in a paper. The colour reaction varies from pink to deep

magenta according to the amount of mechanical wood pulp.

Photocopying Paper: A high-grade base paper, coated with a fast light-sensitive emulsion and used for photographing records, as well as designs and layouts. The base paper varies from 100 percent bleached chemical pulp, usually paper making alpha grade, but differs from ordinary papers in purity and chemical treatment, being made with special precautions to exclude metallic residues. It is specially treated with wet-strength agents to offer resistance to acid, alkaline, and other chemical solutions used in the photographic process. Attention is also paid to the inertness of the paper towards photographic sensitizing mixtures. Uniformity of surface and colour are also important. The paper base is finished with a gelatin sizing to prevent the photographic emulsion coating from penetrating too deeply into the sheet.

Photoelectric Process Base Stock: A coated base stock to be converted into paper for use in photoelectric reproduction equipment. The coated base stock should have the properties of good toluene holdout, a resistivity which is no higher than 10 ohms/square and be little influenced by ambient conditions of relative humidity. It should also have good smoothness, wrinkle resistance, folding and creasing properties and reasonable stiffness. Photoelectric base stock is converted into photoelectric process copy paper by further coating with a mixture of a photoconductive material, resin of high resistance, and material to control the spectral sensitivity of the finished paper.

Photographic Paper: A very high grade of light-sensitive paper used in the preparation of prints from exposed photographic films. The base stock is usually made from purified chemical ('alpha') pulps and/or cotton fibre and this base is normally pre-coated with baryta (Barium sulphate) formulations, followed by sensitization with silver halide emulsions. The grade is characterized by chemical purity, wet-strength and permanence, and is made in a wide range of basis weights, for contact printing, copying, enlarging etc. Some grades are also embossed to provide textured surface. Also referred to as Photo Copying Paper.

Photolithography: A form of lithography in which the printing image or design (either in line or halftone) is created on the printing plate by photographic processes rather than by manual drawing. To make a photolithographic plate, a metal plate must first be coated with a film of light-sensitive material that is soluble in water but becomes insoluble when it is exposed to light. A negative or positive of the design desired on the plate, on film or glass is then placed in close contact with the coated plate in front of a strong

arc light. The light that goes through the transparent parts of the film makes the plate coating insoluble.

Where the plate is shaded by the opaque parts of the film, the coating remains soluble and is washed from the plate. After the light exposure the insoluble coating on the plate is developed to make the image area ink receptive while the area which was washed free of the soluble coating is desensitized so that it is water receptive. This plate, when attached to the printing cylinder of an offset press, is successively treated with water and ink, the water adhering to the desensitized area of the plate and ink adhering to the image ink receptive area. This image is then transferred by contact to the surface of a rubber blanket and again transferred or offset to paper attached to an impression cylinder. This process is known by a variety of names such as photo-offset and offset lithography. The terms offset gravure and lithogravure (or any other use of the word gravure in planographic printing) signify the use of a deep etched offset plate.

Photosensitive Coating: A coating sensitive to light or similar radiation.

Photostat Paper: A silver-sensitized copying paper used for duplicating records, etc., by photographic methods. The term was originally a trade-mark.

Physical/Chemical Waste Treatment: The treatment of mill waste waters by unit processes involving physical and chemical means, such as clarification, filtration, ion exchange, and carbon adsorption, to remove objectionable organic and inorganic contamination.

Pick: (a) The phenomenon of pulp or fibres pulling away and sticking to the paper machine parts they come in contact with, such as rolls, in the wet end and dry end sections. (b) A paper mill control test to determine surface adhesion properties of paper. (c) The small particles of paper which loosen from the surface of paper, especially during printing.

Picking: The lifting of coating film, or fibres from the surface of the body stock during printing.

Pickup Felt: The felt on a paper machine that contacts and lifts a wet web of paper from the surface of a sheet-forming wire or another felt during the papermaking process.

Pickup Press Section: That portion of the wet end press on a fourdrinier paper machine that transfers the wet web from the forming wire and removes some of the water from the sheet.

Pickup Roll: A paper machine roll located at and in contact with the couch roll and wire of the wet end. It aids in transferring the wet web to the press felt which passes underneath it.

Pigment: A finely divided solid colouring material which is insoluble in the medium in which it is applied. Pigments are used in paper to alter physical properties

such as bulk, porosity and bonding, as well as to add colour and improve brightness and opacity. Pigments are also used in printing inks.

Pilot Dryer: An isolated dryer drum in a paper machine dryer furnished with an independent steam and condensate system. It is used as part of a paper moisture measuring and control system.

Pin Adhesion: The resistance to separation of the liners and the corrugated medium of lined corrugated paperboard by means of pins inserted in the flute openings. In testing double-faced corrugated boards, the pins are so inserted as to bear alternatively on the two liners. Pin adhesion is usually measured as the force in newtons required to cause separation in a specimen with an specified area.

Pin Chips: Undesirable, small sized chips, usually removed from the chip supply to a pulp mill during the screening operation. However some inadvertently get through to the digesters.

Pin Paper: Various qualities of antitarnish paper used for making up packets of pins. It may be coated and is usually made in a blue black, yellow, or green shade.

Pinholes: (a) Holes caused by the crushing and falling out of fine foreign particles when the paper is calendered, or produced by grit imbedded in the calender rolls. (b) Pores in thin papers, where the spaces between larger fibres are not filled by smaller ones. (c) Minute pits in the surface of coated papers. (d) Pinholes are also caused by excessive drainage due to free pulp or foaming of stock.

Piping: The corrugated effect produced in paper inadvertently due to irregular tension during reeling or by other causes.

Pit: Mill reference to receiving vessels and tanks for drainage water and white water from screening and sheet formation operations involving pulp stock slurries.

Pit Ventilation: Heated fresh air pumped into the space between the sole plates of paper machines having pits.

Pitch: (a) In the paper industry, pitch is the material (largely a mixture of fatty and resin acids and unsaponifiable organic substances) that can be extracted from mechanical or chemical pulps by means of organic solvents, such as alcohol, benzene and ether. Pitch is associated mainly with the ray cells of the raw material and under certain conditions it accumulates on the fourdrinier wire or the press section and causes trouble in the papermaking operation. (b) The residue from the distillation of coal tar, which is used in the manufacture of roofing, sheathing, etc. as a water-proofing material. The term is also used for the residues from the distillation of wood, petroleum oils, rosin, etc.

Pitch Spots: Dirt specks in paper resulting from resins in the pulp used to make the paper.

Pith: In wood an other fast growing plants like sugarcane, paddy and wheat straws, a cylinder of parenchymous cells, lying centrally in an axis and surrounded by vascular tissue. It is non-fibrous and very light.

Placemat Paper: A grade of base paper made from bleached chemical pulps, for conversion into plain, embossed, or printed placemats, used by restaurants, etc. Such paper is generally fairly light in weight and has offset paper characteristics.

Plaid Finish: A finish obtained by pasting strips of paper between two sheets of cotton and using the sheet in a plater in the normal manner. Variations may be obtained by pasting thread between the cotton sheets, so as to form any desired pattern of straight lines or checkered designs.

Plain: (a) Made throughout from one grade of stock. Plain chip-board and plain strawboard are example. (b) Uncoated, as for example book paper. (c) Unprinted or unembellished.

Plain Settling Tank: A tank or basin in which water, waste-water, or other liquid containing settleable solids is retained for a sufficient time, and in which the velocity of flow is sufficiently low, to remove by gravity a part of the suspended matter.

Planchette Paper: Usually a thin 25 μm lightweight 26 g/m² paper in red or blue from which small round disks are punched in a perforating operation. These disks or planchettes are used to give distinctive features to currency paper to protect against counterfeiting. The term is also used for a cotton-content paper (25 to 100 percent cotton) in which these disks or planchettes are incorporated.

Plant-Cap Paper: Paper used to protect plants from exposure to the sun when first transplanted or from the frost in the cold weather. The paper is crimped so that it may be set over the plants. It is usually waxed. It is also called capping paper.

Plant Capacity: The maximum processing, production, or output potential of a pulp or paper mill, usually expressed in tonnes per day (T/D).

Plant Drier: A gray absorbent paper used by plant collectors in their field work and in the laboratory to press and carry plant specimens. It is usually made from a mixture of cotton and chemical pulps.

Plant Factor: The ratio of the average load to the rated capacity of a power plant in a mill. The rated capacity is the aggregate rating of all the electrical generators.

Plantation: Woodlands that are planted and managed for maximum production.

Plasticized: An agent added in the manufacture of certain papers, such as glassine, or employed in

papermaking compositions or protective coatings, such as nitrocellulose laquers to impart softness and flexibility. Typical plasticizers of interest to the paper industry are glycerol, sorbitol, invert sugar, phthalic acid esters, various types of mineral oils, organic esters of phosphoric acid, and the like.

Plate: A paper mill reference to the rotating disc in refiners.

Plate Clearance: The distance between the surface of refiner discs through which pulp is passed for mechanical treatment.

Plate Finish: A smooth or polished surface on sheets of paper, especially writing papers, produced by placing the sheets between polished plates of zinc or copper and passing a pile of these (called a 'book') under high pressure and slight friction between the rollers of the plating machine. This finish varies greatly in degree, depending upon the pressure used and the number of times the book is passed through the plater and sometimes being a very flat finish without shine and sometimes being a very glossy finish. Many smooth or glossy finishes now obtained by supercalendering are called plate finish and are indistinguishable from the finish obtained by the use of flat metal plates.

Plate Finished Paper: Any paper finished on a sheet plater. The finish may be a smooth or a fancy finish such as linen, ripple or coarse finish.

Plate Wiping Paper: A machine-creped absorbent paper with low stretch and good strength. It is used primarily by engravers and printers for wiping plates.

Platen Dryer: A paper-drying machine made up of a pair of closely spaced, parallel, heated surface, between which the wet paper is passed.

Platen Roll: A roll on a rewinder made up of high polished, hardened steel sleeve, butted together on a core shaft over which the paper passes to be cut by circular knives pressing against it on the opposite side.

Plater: A machine for plate finishing which consists of two chilled-iron rolls, between which the form or book passes, forward and back, as the rolls reverse direction of turning, pressure is exerted only on the top roll.

Plating: The process of producing special finishes on paper by subjecting the sheet to pressure between plating rollers while it is made up in books and is in contact with some material different from the sheet itself, thus producing on the paper an impression that is characteristic of the material used.

Playing Card Stock: A heavy coated paper made for conversion into playing cards. It is usually a three-ply sheet made from chemical pulps, with dark coloured central ply to provide maximum opacity. Some grades are also varnished and/or plastic coated during manufacture or after printing in order to provide

maximum durability. The usual thickness is from 0.254 to 0.305 mm.

Pleasting Paper: A strong, well mixed high finish or water finished paper used by tailors in pleating cloth. It is frequently made of jute and kraft. It must have a smooth surface and good folding qualities and the durability to withstand repeated usage under heat and pressure.

Pleasting Tissue: Usually a semicreped sheet, made in varying basis weights, for fabric pleating. The furnish may range from ground wood and kraft to the highest grades of fully bleached pulps, depending on the fabric material and weight and the nature and designs of the pleat. The paper must be free of imperfection or chemicals that might spoil the pleat or discolour the fabric. The fabric goes through the pleating operation including the setting of the pleat, between two thickness of pleating tissue.

PLI: Abbreviation for 'pounds per linsal inch' the measure of the leading pressure of paper machine presses, particularly board presses. The present terminology for linear lead is kilo Newton per meter (KN/m) presses. The present terminology for linear load is kilo Newtons per meter (KN/m).

Pliability: The property of paper and paper board that permits it to be bent and folded without breaking or cracking.

Plug: (a) The inner conical portion of a jordan-type refiner. (b) Wooden inserts installed in the ends of paper roll cores to keep the rolls from flattening.

Plug Valve: A type of valve used in pulp and paper mills having a rotary motion-operated cylindrical, conical, or spherical segment-shaped closure element housed in an appropriately shaped body.

Plinger Chip Feeder: A type of continuous digester chip feeder in which the chips are compressed while coming in contact with the digester steam so as to form a wet plug, compact enough to seal in the digester pressure.

Ply (of Paper or Board): (a) One of the separate web which make up the sheet formed on a multicylinder machine. Each cylinder adds one web or ply, which is pressed to the other, the plies adhering firmly upon drying. (b) One of the sheets which are laminated to build up a pasted board of given thickness. (c) One of the separate layers which together make up a multilayer aggregate such as multi-ply tissues, multiwall shipping sacks and carbon-inter-leaved business forms.

Ply Adhesion: (a) The bending strength between the plies of a paper or paperboard. (b) The bending of multi-ply tissues after embossing.

Pneumatic Chip Conveyor: A chip transporting system sometimes used to move chips from outside storage to the pulp mill digester house. It uses air as a

carrying medium, and consists of a large positive displacement blower discharging through a venturi tube into sheet metal piping to which the chips are fed by a star-feeder.

Pocket Envelope: See 'Correspondence Envelope'.

Polarity Paper: A filter paper impregnated with an indicator and salt that is moistened and used to determine the positive or negative pole of a direct electric current. It is paper, saturated with sodium chloride, and phenolphthalein solution, has two wires placed upon it a little distance apart. Electrolysis takes place and the hydroxyl ion will colour the phenolphthalein red; hence the corresponding wire is the positive electrode.

Pole Mark: See 'Back Mark'.

Policy Paper or Policy Bond: A high quality bond or writing paper commonly used for insurance policies.

Polished Drum Coating: A process in which the coating is applied in any suitable manner and immediately placed with the coated side against the surface of a highly polished, heated drum which smooths and dries the sheet without the necessity of subsequent calendering or polishing. This is a type of cast coating.

Pollutant: Any introduced gas, liquid or solid that make a resource unfit for a specific purpose.

Pollution: The contamination of the surrounding mill environment and natural bodies of water with undesirable gaseous, liquid, and solid materials released from the pulp and papermaking process.

Pollution Abatement: The process of implementing means of reducing or eliminating the contamination of the surrounding mill environment and bodies of water by minimizing the release of undesirable gaseous, liquid and solid materials from the pulp and papermaking process.

Pollution Load: A measure of the strength of a wastewater in terms of its solid or oxygen-demanding characteristics, or in terms of harm to receiving waters.

Pollutional Index: A criterion by which the degree of pollution of a stream or other body of water may be measured, such as material density, plankton, benthos, biochemical oxygen demand, dissolved oxygen or other index of water quality.

Polyethylene: A plastic compound formed by the polymerization of liquid ethylene at high temperatures and used as a paper or paper-board coating to provide liquid resistance and other qualities. Paper milk bottles are examples of products commonly coated with polyethylene.

Polyurethane: A material used as paper machine roll coverings instead of the conventional rubber coverings.

Poor Core Start: See 'Bad Core Start'.

Pop Valve: A spring-loaded, quick-opening, safety valve which opens automatically when pressure exceeds limits for which the valve was set. It is commonly used on power and recovery boilers and other equipment to protect them from damage due to excess pressure.

Pope Reel: A type of reel used for winding up rolls of paper as they come from the calenders. It consists of a large diameter drum whose peripheral speed is synchronized with the paper machine. These are steel arms at each end of the drum with saddles into which the bearings of the reel spool fit for continuous, uninterrupted change of rolls.

Porosity: This is the property of paper and paper board, related to the ability of fluids to pass through the pores or minute interstices. It is an indication of the size, shape and distribution orientation of the pores in a sheet and the compactness of the fibres sometimes incorrectly referred to or related to air permeability and vapour permeability.

The permeability of a sheet of paper or paper board existing in a parallel direction to the surface is called 'Lateral or Transverse porosity'.

Post Colour (PC) Number: A value determined in the measurement of pulp and paper colour reversion before and after heat ageing.

Post Screens: Plate-type and vortex-type screens located after the main centrifugal screens in a groundwood stock screening system to rescreen the accepted stock.

Postage Stamp Paper: Paper used in the production of various types of postage stamps having special properties including offset or intaglio printing qualities, non-curling characteristics and good perforating and gumming qualities.

Postal Money-Order Paper: Bleached chemical pulps are used in making the base stock. The surface of the paper contains a dye or other substance sensitive to the action of chemical reagents such as ink eradicators, to show clearly any attempt at mechanical erasure. The dyed or impregnated fibres form a pattern only on the surface of the paper. Sensitivity and bond paper characteristics are significant properties.

Postcard Board: Buff coloured board used for making postcard, which may be of three different types, writing, printing or sensitized depending on end use. The board should have smooth finish on either side, absolutely free from fluff, creases, cuts, wrinkles, etc. The board should be stiff enough to have good shearing strength.

Postcard Bristol: It can be made in antique, vellum and high finishes. Important properties are colour, finish, rigidity and sizing.

Postcard Paper: Paper used for making postcards which may be at least three different types; writing, printing, and sensitized, depending on use. The first is for mailing brief, written, typed, or printed nonconfidential messages; the second, for picture cards which serve as souvenirs and messages carrier; the third for photographic purposes whereby a typical picture card is produced. Card stock coated or uncoated, or pasted, and photographic paper, are used.

Poster: Advertising matter printed on paper or paperboard for display.

Poster Board: A stiff cardboard, usually 0.60 to 0.76 mm in thickness lined on one or both sides with white or coloured book paper in sizes 56×71 cm and 71×112 cm. It is used for indoor and outdoor advertising posters, games, cutouts, etc.

Poster Paper: A variety of paper which has been machine-glazed, suitable for printing poster, labels, etc.

Potcher Washer: A type of breaker in which washing and bleaching of the pulp suspension can be carried out. For washing, a perforated cylinder is partially immersed in the pulp to allow the continuous extraction of liquid.

Powdered Paper: (a) Manila paper, sometimes waxed or treated for wrapping charges of powder used in mining. (b) A paper similar to cigarette paper but which is coated with a facial powder that is easily rubbed off.

Powdering: See 'Dusting'.

Power Boiler: That portion of a steam-producing unit in which water is converted into steam for use in the process or to produce electricity.

Power Factor: (a) The power factor of a dielectric material, such as paper, is a measure of the heat generated within the material when the latter is subjected to an alternating electric field of a given strength and frequency. It is the cosine of the phase angle between the applied a.c. voltage and the current resulting from the applied a.c. fields, for example when the material is the dielectric of a condenser or cable. This property is especially important in condenser and cable papers. It is a measure of dielectric loss. (b) It is the ratio of actual power consumed, to apparent power, generally expressed as percentage to indicate effective power utilisation.

Power Furnace: That portion of a steam producing unit where the combustion of fuel occurs to produce heat required to convert water into steam in the boiler portion.

Power Pumps: The types of reciprocating pumps that are driven from the outside through a crankshaft or other device.

Powered Relief Valve: An electrically or pneumatically operated quick opening safety valve on a

power boiler which can be manually opened from a remote control panel.

PPM: Abbreviation for 'Parts per million'.

Precipitators: Mechanical and/or electrical separating devices used to collect fly ash and solid particulate matter from gaseous emissions emitted by power and recovery furnaces to prevent discharges into the atmosphere.

Precision Recording Paper: Similar to chart paper but made so that it will expand and contract very little when exposed to changes in atmospheric conditions. It is used on precise scientific instruments where changes in dimensions of the paper would record inaccurate measurements or values.

Precoat: A preliminary coating that is impervious enough to give satisfactory coating hold-up on final coatings.

Prehydrolysis: A process involving the presteaming of chips in a digester under pressure to promote mild acid hydrolysis prior to the addition of the cooking liquor. Prehydrolysis usually applied to kraft-type pulping process used in the manufacture of dissolving pulp sometimes acid is added in small quantity to aid the process.

Preservative Paper: Papers of wrapping food stuffs. They contain salicylic acid or some other preservative.

Preservatives: Chemical additives that prevent or inhibit the growth and development of harmful bacterial growth in the stock, giving rise to foul smell, colour, reversion, etc.

Press: In a paper machine a pair of rolls between which the paper web is passed for one the following reasons: (a) water removal at the wet press. (b) smoothing and levelling of the sheet surface at the smoothing press. (c) Application of surface treatments to the sheet at the size press.

Press Board: A board made usually on an intermittent board machine and afterwards subjected to pressure to consolidate the plies and subsequently dried highly calendered.

Press Marks: Marks in paper caused by imperfections in press rolls or felt.

Press Trimming: The trimming of paper to accurate size and shape on a guillotine or other types of trimmer.

Pressings: Thick, tough, tinted covers made on a single-drier cylinder machine, therefore with machine-glazed finish. Made originally for the silk and dyeing trades, they are now used for packing covers of exercise books, box coverings and similar uses.

Pressmark: A mark or design impressed into the wet web of paper, usually at the second or third press, by

means of a rubber roller which carries the design and which is suitably mounted on a steel shaft.

Presspahn: Glossy pressboard (*See* 'Pressboard') or paper having a high density, chiefly characterised by its electrical insulating properties and its high mechanical strength, capable of being pressure moulded.

Pressure Couch Roll: *See* 'Couch Roll'.

Pressure Joint: A specially designed rotary steam fitting used on paper machine dryers to admit steam to the individual drums and remove the condensate formed by the condensing steam.

Pressure Pulp Washer: An enclosed rotary drum pulp washer that operates under pressure at higher temperatures, permitting washing closure to the boiling point.

Powder Pocket: A pocket or bag made by special cutting and folding of the corners designed to prevent spillage of powders or granular substances.

Pressure Reducing Valve (PRV): A valve used to regulate either upstream or downstream pressure in steam distribution systems in a power plant and in other pressurized flow vessels and lines.

Pressure Roll: *See* 'Breaker Roll'.

Pressure-Sensitive Paper: A paper impregnated or coated on one or both surfaces with a pressure-sensitive adhesive. It is used in the manufacture of pressure-sensitive tapes and also labels as for example price or identifying labels on various articles of merchandise.

Pressurized Centrifugal Screens: Enclosed, centrifugal screens that are completely filled on both feed and accept sides, and are kept from plugging by vanes that move around the inside of the cylindrical screen and which create a pressure wave ahead of them and backflow after them.

Pressurized Headbox: An enclosed tank at the wet end of a paper machine in which the head or level of the stock is regulated by loading it with air or applying vacuum to provide uniform flow on the paper machine wire. Also called air cushion headbox.

Pressurized Refiner Mechanical Pulp (PRMP): Pulp made by mechanical separation of fibres from chips in refiners under pressurized conditions and with no preheating.

Presteaming: Treating chips with low pressure steam to remove air. This action promotes cooking liquor penetration during a subsequent cooking process.

Pretreatment: In wastewater treatment, any process used to reduce pollution load before the wastewater is introduced into a main sewer system or delivered to a

treatment plant for substantial reduction of the pollution load.

Primary Black Liquor Heater: A heater located between the discharge of the black liquor nozzle pump and the black liquor nozzles in a recovery furnace of a sulphate pulp mill. It can be of either the indirect or direct steam injection type.

Primary Fine Screens: Pulp screens located immediately after the bull screens and used to remove shives, fibre bundles, and coarse fibres in a groundwood pulp mill. These screens include both horizontal and pressurized centrifugal types.

Primary Press: *See* 'Baby Press'.

Primary Sludge: Sludge obtained from a primary settling tank.

Primary Treatment: The removal of suspended matter from mill waste water by sedimentation. It is usually the first stage in a multi-stage waste treatment process, where substantially all floating or settleable solids are mechanically removed by screening and sedimentation.

Priming: The passing of water from a power or recovery boiler with the steam.

Priming the Pump: Filling a centrifugal pump with the liquid to be pumped so that the pump starts to work.

Print-on Coating: A process in which the coating is applied to paper or paper board by means of applicator rolls which print an accurately metered evenly distributed film of high density coating mixture directly on the paper.

Printability: That property of a paper which yields printed matter of good quality. This complex property is not accurately defined; it is judged by uniformity of colour of the printed areas, uniformity of ink transfer, contrast between the printed and unprinted areas, legibility of the printed matter, and rate of ink setting and drying ink receptivity, compressibility, smoothness, opacity, colour, and resistance to picking are among the simple properties which jointly determine printability. Printability should be distinguished from runnability which refers to the efficiency with which the paper may be printed and handled in the press.

Printed Box Cover: A lightweight cover paper, plain or coated and embellished by a printed design in one or more colours, which is commonly used for box covering and other purposes.

Printed Opacity: The ratio of the diffuse reflectance of the uninked side of a sheet printed in a solid colour to the diffuse reflectance of an opaque pad of the unprinted paper. It is a measure of the show-through exhibited by a printed sheet. This quality depends upon the colour and density of the ink, the strike-in of the ink and ink vehicle or both, and upon the opacity of the paper.

Printing Opacity: The ratio of the diffuse reflectance of the sheet when backed by a black body to that when backed by an opaque pad of the paper itself. It is important in book papers where the sheet is viewed when backed by printed pages; it is a measure of the visibility of printed matter on a sheet lying below the viewed sheet.

Printing Paper: Any paper suitable for printing, such as book paper (general definition), Bond, Bank, Maplitho, Writing paper, etc.

Printing Processes: In general, there are four fundamental printing processes; Letterpress or relief, intaglio, planography and silk screen. (Other methods of reproduction, used as a substitute for printing when a relatively small number of copies is required, include the Mimeograph stencil, Multigraph and spirit duplicator). Letterpress or relief printing includes printing from raised type, halftone, or woodcuts by a platen, cylinder or rotary press. Intaglio or gravure printing includes printing from engraved plates, etching photogravure, and rotogravure. Planography of flat-surface printing includes lithography, offset, aquatone, collotype, etc. Silk-screen printing uses a stencil (silk or other material) through which ink paint, etc, is forced by a rubber squeegee. The printing processes are Aquatint, Aquatone printing, Collotype printing, Deep-etch offset Design printing, Die embossing, Die stamping, Direct lithography, Driography, Electrostatic Printing, Etching, Flexographic printing, Hot smashing, Hot stamping, Ink-jet printing, Intaglio printing, Letterpress printing, Lithography Mezzotint, Mimeograph, Multigraph, Multilith, Offset lithography, Photogravure Printing, Photolithography Planographic printing, Rotogravure printing, Screen printing, Thermography.

Printings: A general term used by some printers to indicate various grades of book papers.

Process: The operation of pulp and papermaking in which physical or chemical changes in matter occur; or a conversion in energy, such as a change in pressure, temperature or speed takes place.

Process Automation: Implementing process control by use of computers and advanced electronic instrumentation to minimize direct operator involvement while maximizing data availability for more informal decision making.

Process Colour: The process of producing printed materials with infinitely variable gradations of colour (hue) and tone by the combination of varied tints of three colours (cyan, magenta and yellow) and sometimes black. This is a subtractive system, using transparent inks to filter out some of the wavelengths from the white light reflected from the paper.

Process Control: The regulation or manipulation of variables influencing the conduct of any pulp or papermaking operation in such a way as to obtain the

maximum amount of product within prescribed quality specifications.

Process Water: Any water in a pulp and paper mill that is used to dilute, wash, or carry raw materials, pulp, and any other materials used in the process of making pulp and paper.

Production: The actual amount of paper made on a paper machine or in a paper mill, usually expressed in tone/tonnes per day.

Production Cost: The fixed costs plus the raw material, chemicals and labour costs to manufacture paper, usually expressed in rupees per tonne of finished paper or board.

Profile Paper: (a) A black cover paper to be used for making silhouettes. (b) A drawing paper specially ruled for engineer; and surveyors, in which case it might be considered as a cross-section paper. The usual pattern is 0.025 inch squares subdivided 5 times in each direction; if metric, centimeter square subdivided 10 times in each direction.

Program Paper: (a) Any paper used for programs. A very wide range of qualities is used. No one grade or specification dominates this field. (b) Soft printing paper so manufactured that it can be handled without rustle or rattle. It may be unsized, drying paper being sometime used for this purpose.

Programmable Controller (PC): A solid-state device used in pulp and paper mills to replace conventional electrical and mechanical logic equipment, such as relays, stepping switches, timers, and cam and drum programmers. They perform sequence and logic control by accepting binary (on-off) inputs coming from such devices as pushbuttons limit switches, and other contact devices in the process. They generate binary outputs to such devices as motor starters, stopping switches, and solenoid valves. They can also be used to accept and transmit analog signals which can be used for control purposes. Often referred to as a programmable logic controller (PLC).

Progressive Proof Sheets: Proving paper, one sheet of which is used for each of the colours used in multicolour printing.

Proof or Proofing Paper: (a) A high-grade, smooth finish cardboard or heavyweight coated paper used for making engravers' proofs. (b) A cheap book paper or newsprint, used for making galley proofs. (c) Chromo as used by block makers.

Proportioners: Various type of units or systems used to mix the various components in making multi-pulp furnishes in a paper mill. They can consist of multi-compartment stock regulating boxes with adjustable dams to complete automatic in-line control systems using a combination of ratio controllers all responding to a signal representing paper stock

demand. Sometimes referred to as stock blending systems.

Protective Paper:(a) A writing paper which has been treated or modified to prevent fraudulent duplication or alteration of the matter printed or written thereon. (b) Any grade of paper which is used in a protective sense, such as wrapping paper.

Protocol: A set of rules programmed into digital process computers for converting signals that allow them to communicate with each other.

Psychrometer: A measuring instrument used to determine the concentration of water vapour in air to ascertain the humidity.

Psychrometric Chart: A convenient graph generally used by paper mills to determine the composition and thermodynamic properties of moist air. It includes dry bulb, wet bulb, relative humidity, absolute humidity, and dew point readings.

Pucker: A cockle like surface effect on paper which has contracted unevenly during drying.

Pug Mill: A unit used to treat lime mud in the lime recovery area of a pulp mill before being processed in fluid bed calciners.

Pulley: A wheel or combination of various sized wheels with grooved rims in which a rope, cord or chain is run to amplify the force applied at one end for lifting heavy weight or pulling heavy loads in a pulp and paper mill.

Pullover: A pulp mill term for the cooking liquor mixed with relief gases and emitted from a sulphate batch digester during the cooking process. Also called carryover.

Pulp: Fibrous material prepared from cellulosic raw material of wood, cotton, bamboo, bagasse, straw grasses, etc, by chemical or mechanical processes for use in making paper or cellulose products.

Paper Micrometer: An instrument used for measuring the thickness or caliper of paper or paperboard sheets.

Pulp and Paper Contraries: Any unwanted matter that is present in the pulp (*see* 'Pulp') Stock (*See* 'Stock') paper or board under consideration.

Pulp Board: Board manufactured in one layer or by bringing two or more plies of the same furnish into a single structure in the wet state without adhesive.

Pulp Colour: Colour lakes; sometimes also pigments sold in paste form, such as the chrome yellows.

Pulp Content: The fibre content by analysis of any paper or paperboard exclusive of clay or any other filler or coating materials.

Pulp Sheet: Pulp, usually market pulp, in sheets from a pulp drier prepared in this form for convenience in shipment and handling.

Pulp Substitutes: Clean, unprinted or superficially printed waste papers which can be reused directly in the papermaking process with little or no preparation except beating and refining. Common pulp substitutes are envelope cuttings, tabulating cards, mill side runs, shavings, converting waste, etc.

Pulper: A machine designed to break up, defibre, and dispers dry pulps mill process broke commercial waste papers, or other fibrous materials into slush from preparatory to further processing and conversion into paper and paperboard. It normally consists of a tank or chest with suitable agitation to accomplish the dispersion with a minimum consumption of power. It may also be used for blending various materials with pulp.

Pulper Stock: Pulp from such sources as pulp sheets, dry broke, reclaimed paper, etc, which has been mechanically disintegrated by agitation in water using a device known as a pulper.

Pulping: The operation of reducing a cellulosic raw materials, such as pulp wood, bamboo, rags, straw, reclaimed paper, etc, into a pulp suitable for further processing into paper or paperboard or for chemical conversion (into rayon, cellophane, etc). Pulping may vary from simple mechanical action to rather complex digesting sequences and may be conducted in batch or continuous equipment.

Pulpstone: A natural or artificial stone (grindstone) which channeled or grooved and used for the manufacture of mechanical pulp (ground-wood).

Pulpwood: Those woods which are suitable for the manufacture of wood pulp. The wood may be in the form of logs as they come from the forest or cut into shorter lengths suitable for the chipper or the grinder. The term may also be applied generally to chips produced from roundwood or from whole trees remote from the pulp mill.

Pumicestone Paper: An abrasive paper which is coated with pumicestone of varying degrees of fineness.

Punchboard: A paperboard used for advertising purposes in selling articles upon chance. It is made of pasted chipboard or builders board. Holes are punched out of the board and into each is inserted a small ticket. A printed form indicating where the board is to be punched is then pasted over the top. The board is stiff and gives smooth edges where punched.

Punchboard Paper: A thin, hard paper, used for filling the holes in punchboards. It has a rather high finish and good folding qualities.

Puncture: The resistance of paper or paperboard to perforation, as measured with a puncture tester having a pyramidal steel head, and expressed as the energy in puncture units (one puncture unit is 0.265 inch-pound).

Pure: Means wood-free or free from ground wood pulp.

Purge:(a) A flow of air, water, gas, or any other fluid used to maintain a process measurement connection free of buildup or plugging with the process medium. (b) In a power or recovery furnace it is the flow of air through the furnace boiler gas passages and associated flues ducts, evaporators, and precipitators to remove any combustible gases.

Pyrolysis: The process of chemically decomposing an organic substance by heating it in an oxygen-deficient atmosphere. High temperatures and closed chambers are used.

Pyrometer: Temperature-measuring system that operates on the radiation effect of a heated body without physical contact with the body. It is used to measure temperatures of objects which are inaccessible by any means other than visual, such as molten lime in lime-burning kilns, recovery and power boiler interiors, and moving paper sheet surfaces on paper machines.

Pyroxylin-Coated Paper: A paper which is coated with a pyroxylin lacquer (cellulose tetranitrate dissolved in a solvent) used for box coverings, greeting cards book covers, labels, menus, food wrappers, tobacco wrappers, artificial leather, etc. The lacquer may be clear or coloured by dyes or pigments. Such papers are also manufactured with gold, silver and copper metallic finishes.

Pyroxylin Paper: A paper coated with pyroxylin lacquer. The coated paper is water repellent and has peculiar gloss.

Package: The product of a complete series of packaging operations or a unit consisting of a number of such products.

Package Life: The comparative or estimated period assessed under standard test or simulated marketing conditions of temperature and humidity over which a package would allow the contents to remain satisfactory or saleable by providing resistance against the transmission of moisture, atmospheric gases and odours which cause physical, physico-chemical, micro-biological, chemical and enzymetic changes in the packed goods.

Packaging: The art of and operations involved in the preparation of articles or commodities for carriage, storage and delivery to the consumer.

Packet: Same as 'Package'.

Packing: The operation of packaging by which articles or commodities are enveloped in wrapping and/or enclosed in containers or otherwise secured.

Pressure-Sensitive Tape: A tape which utilizes adhesives that adhere by simple contact and do not rely on physical or chemical change for adhesion. It is usually a strip of paper, fabric or flexible film coated with a pressure sensitive adhesive which is normally

supplied in rolled form. These are also known as 'self adhesive tapes'.

Q

Quadrafos: Another name for sodium tetraphosphate, an inorganic dispersing agent used in paper mills to reduce the viscosity of pigment suspensions for the surface treatment of paper and paperboards.

Quadrille Finish: A paper finish which is watermarked or embossed with small squares. It is usually found on fine writing paper and fancy table specialities.

Quality Control: Maintaining, during the production of paper and paper board, the conditions necessary to produce a level of properties and physical characteristics in the final product within variable limits as established to be satisfactory for its particular end use.

Queen Roll: The second roll from the bottom and the first undriven roll on a typical paper machine calender stack in a paper mill. It is smaller in diameter than the bottom, driven roll (king roll) but larger than the rest of the undriven rolls above it.

Quench Circulation: Withdrawing and returning cooking liquor from a Kamyr-type continuous digester to a point where reaction is almost completed. It is done to produce a countercurrent flow in the digester that cools the chip column and essentially stops further reaction.

Quench Extraction: The removal of reaction product and spent cooking liquors from the pulp after reaction is almost completed in a kamyr-type continuous digester.

Quick Opening Valve: A valve (usually of the gate type) that has a sliding stem and level so that it can be opened and closed quickly.

Quire: One twentieth of a ream. Twenty-five sheets in the case of a 500-sheet ream of fine papers, and 24 sheets in the case of a 480-sheet ream of coarse papers.

Quired: In ream packing, having sheets folded in half (in sections of twelve), instead of being put up flat.

Quadrant Scale: A type of balance used to determine directly the grammage of paper and board. It has a graduated scale in the shape of a quarter circle fixed to a rigid stand with a hanger or credle for supporting paper sample to be weighed. The hanger with a pointer, moving on a frictionless bearing directly reads the grammage (g/m^2) of the sample.

R

Raceway: (a) A channel that contains electrical wiring and runs throughout the mill. (b) A channel for routing water to various parts of the mill.

Radial: Along or in the direction of the radius of the pump impellers.

Radial Flow Mixer: A type of mixer developed especially for use in medium density, upflow bleach towers. They are designed to mix the bleach chemical with the pulp and direct the flow in such a manner as to provide uniform movement up the tower.

Radiant Dryers: Electric or gas infrared heaters, consisting of a bank so located as to provide high-density heating for selective drying of paper on a paper machine.

Radiant Heat Transfer: The electromagnetic transfer of heat between body surfaces which are separated by a vacuum or by a transparent media.

Radiant Superheater: A type of heat exchanger installed in a furnace so that it is usually a part of the wall or gas pass, allowing it to absorb the heat of radiation from the hot gas.

Rag Book: A paper used for high-grade books when a quality or a longevity feature is important. The term is applied to a wide range of book papers with a cotton fibre content of 25, 50, 75 or 100 percent.

Rag Content: A term used interchangeably with cotton fibre content which indicates that a paper contains a percentage of cotton fibre pulp.

Rag-Content Paper: Paper containing rag or cotton fibre. They are used for quality papers like bonds, currency, writing, ledgers, manifold and onionskin, paperteries and wedding, index carbonizing, blueprint, and maps and charts and other industrial specialities where durability and high printing writing qualities are required.

Rag Cutter: A machine used in a rag pulp mill to cut sorted rags into strips prior to cooking. It generally consists of a revolving lawnmower-type knife assembly.

Rag Duster: See 'Duster'.

Rag Plate Paper: Rag book paper with a supercalendered finish.

Rag Pulps: Papermaking fibres of cotton made from materials like new or old cotton textile cuttings or cotton linters, mill run, fly cotton, cotton waste, etc. Rag pulps are used in papers where permanence and durability are needed, for example ledger, blueprint, map, currency papers, etc.

Rag Thrasher: A piece of rag pulp mill machinery consisting of two rotating, cylindrical drums to which old rags are fed for a teasing treatment prior to passing into the dusting operation.

Ramie: A plant of the nettle family native to tropical Asia, but cultivated in other sufficiently warm regions. The botanical name is *Boehmeria nivea* (especially important is variety *tenacissima*). The best fibre from the decoraticated material is commercially known as

China grass and is used as a textile fibre. It is a potential source of papermaking fibres.

Rate-of-Set: A property used as a basis in selecting an adhesive emulsion for a particular application. It is a measure of the minimum time required for the emulsion system to create a bond between the two surfaces of paper sheets.

Ratio Control: A control scheme based on relative proportions between two variables, usually flow and extensively used in adding and mixing materials in the process of pulp and paper manufacturing, especially in stock blending.

Rattle: Noise produced when a sheet is shaken. While it is sometimes considered indicative of the quality of bond paper, its absence is important in some papers used before an audience, especially when the speaker uses a microphone.

Raw Cook: See 'Hard Cook'.

Raw Effluent: Untreated wastewater being discharged from pulp and paper mill operations.

Raw Materials: Any materials, such as wood, water, chemicals, dyes, additives, fuels, etc, brought into a pulp and paper mill that are required and used in the production of pulp and paper or used in producing products for use in pulp and paper manufacturing.

Raw Water: Source water supplied to pulp and paper mills that has not been given any type of a purification treatment, except for possible screening.

Ray Cells: Short cells, chiefly parenchymatous, which make up the wood ray. The wood ray is a ribbonlike strand of tissue extending in a radial direction across the annual rings of the wood. A large proportion of these cells is located in the sapwood.

Rayon Rejects: Cellophane and rayon pulps that fail to measure up to specific requirements for use in chemical conversion plants. Their physical characteristics made them usable in papers where strength is a minor consideration and softness and absorbency are desired.

Reaction Wood: Wood with special characteristics formed in leaning or crooked stems and branches of trees. It consists of tension wood in hardwoods and compression wood in softness.

Ream: (a) Paper—A packet of 500 sheets (or 480 sheets) of paper of a given size. (b) Boards or Paper Boards—A packet of 144 sheets (or 100 sheets) of board of a given size.

Ream Labels: Labels pasted on the ends of sealed packages of paper (each containing a ream) to describe the contents.

Ream Mass: Mass in kilograms of a ream of paper or paper board including wrapper paper. Wherever ream mass is mentioned, the size of the sheets, the substance and the number of sheets per ream shall be stated.

Receiving Waters: Natural bodies of water, such as rivers, lakes, oceans, etc, into which treated or untreated waste waters are discharged.

Receptivity: Acceptance of oil, water, or other liquid by the surface of paper; it depends on the wetting of the surface by the liquid and the initial rate of penetration of the liquid into the surface. Ordinarily this term implies penetration under capillary forces alone, but in some printing processes penetration is aided by pressure.

Recesses: Spaces formed and occupied by voids or spaces in a sheet of paper. Sometimes called voids in paper.

Rechipper: A machine used in the chipping process in a pulp mill to reduce to acceptable size large chips and slivers removed during the screening operation so that they can be returned for processing.

Recipe: The list of pulp, chemicals, additives, and dyes blended together to make a particular grade of paper.

Reciprocating Pump: A type of liquid-moving device that uses a piston, plunger, diaphragm, and other devices moving in a back-and-forth manner to positively displace a given volume of liquid during each stroke of the unit within a suitable fixed casting.

Recirculation: (a) The flow around and behind an impeller before existing through the pump discharge. (b) The removal and return of a portion of the process material during the manufacturing operation, such as cooking liquor during a batch cooking operation and during a pulping cycle or from a storage tank.

Reclaimed Fibre: Recovered fibre in a pure or usable form obtained from refuse matter wet and dry machine broke and retrieved paper.

Reclaimed Paper Pulp: A papermaking fibre made from waste papers, such as old newspapers, magazines, corrugated boxes, office waste, printing plant wastes, etc.

Recoverable Resources: Any used process materials that still have additional useful purposes and are recycled back into the process, such as water and paper broke in a paper mill.

Recovery: Deriving a substance in usable form from refuse material.

Recovery Boiler: A combination unit in a recovery plant used to recover the spent chemical from spent cooking liquor received from pulp mill and to produce steam and recover sodium chemicals for reuse.

Recovery Furnace: The unit in a sulphate pulp mill in which concentrated spent cooking liquor (black liquor) is burnt to a smelt to recover inorganic sodium salts and to generate steam.

Recovery Plant: The area, building, or buildings where all of the process units considered to be included

in the chemical recovery cycle of a pulp mill are located.

Rectifier Roll: A roll located just ahead of the slice in some paper machine headboxes for stabilization and conditioning of the stock flow.

Recto: (a) Sheet—The first side of a processed sheet as distinct from the verso, which is the reverse side.

(b) Book—The page on the right of an open book. The following or second page being the verso. Also applies to Newspapers.

(c) Postal Documents—The face on which the addressee's address is written.

Recycled Fibre: Cellulose fibre reclaimed from waste material and reused, sometimes with a minor portion of virgin material, to produce new paper.

Recycled Paper: Usually old newspaper or waste paper and packaging waste used already.

Recycling: The return of a once-used material for reprocessing into new products. In the paper industry, recycling refers to the process involved in making new paper out of previously used paper including in-plant and postconsumer waste.

Red Patch Paper or Board: A red paper or paperboard, made from virgin chemical pulp and/or selected reclaimed paper stock. It is used for patches, reinforcement for the eyelets of tags, and buttons patches, reinforcement for the eyelets of tags and buttons on envelopes.

Red Rosin Sheathing Paper: A sheathing paper coloured red. It is made of waste papers on a cylinder machine, well sized and with a hard finish. The paper protects against wind and dust and is water and moisture repellent. It is used under sidings, between floors, for lining walls to keep out dust, dirt and draft, as lining for box cars, and as protective coverings over new floors before completion where a waterproof paper is not required.

Red Wallet: A flexible paperboard used principally in making expanding envelopes or wallets and also for the folders. It is made from hemp jute, sulphite or sulphate pulps, sometimes with an admixture of mechanical pulp. It may be made on a cylinder or fourdrinier machine.

Reducer: A pipeline connector having a smaller size on one end than on the other.

Reducible Sulphur: Any form of sulphur or sulphur compounds in paper that can be converted to hydrogen sulphide on treatment with a metal such as aluminium and an acid. It is a measure of the quantity of sulphur compounds in paper that may react with metals to cause tranishing.

Reducing Agents: In pulp bleaching, it refers to chemicals, such as sulphurous acid and its salts,

dithionites, borohydrides, etc, which brighten pulp by reduction of lignins and other colouring impurities.

Reduction Efficiency: An expression used in a pulp mill chemical recovery plant to indicate how well the conversion of the sulphur to sodium sulphide (Na_2S) has taken place in the recovery furnace. This is usually determined by dividing the sodium sulphide by the total sulphur in the smelt, and expressed as a percentage.

Reel (of Paper or Board): Continuous web of paper or board wound on a core.

Reel Samples: Samples taken from the reel as the paper is being manufactured; usually one sample is taken from each reel; such samples are used for physical tests of the paper or for reference purposes.

Reeling: The action of winding a continuous web of paper or board on a core.

Refiner: A machine used to rub, macerate, bruise, and cut fibrous material, usually cellulose, in water suspension to convert the raw fibre into a form suitable for formation into a web of desired characteristics on a paper machine. The many types of refiners differ in size and design features like conical refiners and disc refiners. Beaters are not usually referred to as refiners although in a board sense they serve a similar function. Refiners may be used in various combinations of types and numbers of units depending on type of stock to be treated and the capacity required.

Refiner Bleaching: The process of adding bleach liquor to a mechanical refiner in which chips or pulp are being defibreized.

Refiner Groundwood: Mechanical pulp made with a grinder and put through a rubbing, brushing, crushing, fraying, or cutting treatment in a pulp mill processing machine called a refiner.

Refiner Mechanical Pulp (RMP): Pulp made by processing untreated wood chips in mechanical atmospheric refiners.

Refining: Any of several operation, all of which involve the mechanical treatment of pulp in water suspension to develop the papermaking properties of hydration and fibrillation and to cut the fibres to the desired length distribution.

Refining Agents: Materials added to pulp slurries prior to refining to facilitate the separation and conditioning of fibres undergoing mechanical treatment.

Reflectance: The ratio of the intensity of the light reflected by the specimen to the intensity of the light similarly reflected by a standard reflector. The instrument and the conditions of measurement must be carefully specified. The spectral reflectance curve gives the reflectance of the specimen as it varies with wavelength throughout the whole visible spectrum.

Reflectancies of importance in the physical measurement of colour brightness and opacity.

Reflectivity: The reflectance of a sample, for example a pile of sheets, thick enough so that no change in reflectance is observed when the thickness is doubled.

Refrigerator Paper: Paper used in the walls of a refrigerator as an insulating material. It is made of two or more sheets of kraft paper which have been treated to render them impervious to moisture and then creped, the sheets being combined by means of asphalt. The paper may or may not be reinforced. Such a product is durable and does not allow the passage of vapours.

Register: (a) Exact correspondence in the position of pages or other printed matter on two sides of a sheet or in its relation to other matter already ruled or printed on the sheet. (b) To print a succeeding form or colour so that it is in correct position with reference to matter already printed on the sheet. (c) In paper ruling, a sheet is said to register when ruled on both sides so that when the sheet is held up to the light the lines exactly coincide.

Register Bond: A common type of lightweight writing paper designed for single and multi-copy business forms and variations thereof such as computer output forms, snap-aparts, unit sets, carbon interleaved order books, invoice sets, and the like. The grade is usually made from chemical pulps. Important product qualities include printability, good tensile and tearing strength, perforating, folding and manifolding qualities.

Register Test Sheet: Paper run through the press to test its register.

Regular Size: A regular standard size of any kind of paper, as distinguished from irregular sizes. In roll paper, a regular size is one in which the roll width corresponds to either of the two dimensions of a standard sheet size.

Regular Weight: Any weight that is standard for the grade as established by trade customs.

Regulating Box: A constant level, baffled flow chamber provided with a consistency sensing element. It is used to add water in order to maintain the consistency at a constant value, and is usually found on the stock feed lines to the paper machines.

Regulator: A device that senses a process variable or condition, compares it with some preset value and initiates action to correct any deviation between them. Consistency, pressure and temperature regulators are examples of the wide variety used in the pulp and paper industry.

Reinforced Building Paper: Two plies of strong kraft paper laminated together with asphalt and reinforced with fibreglass, jute or other fibrous material. It is

strong and reasonably moistureproof. It is generally sold in rolls of selected footage.

Reinforced Filler Paper: A notebook filler paper with some type of reinforcement designed to prevent tearing at the holes. Common reinforcing materials are metal's cloth, paper, or polyester film applied locally as a patch, or as a strip along the margin of the sheet where the holes are located.

Reinforced Paper or Board: (a) A multi-ply paper or board of varying weights depending upon its use, which is united by means of asphalt or adhesive, embedded in which is the necessary reinforcing material, such as string, yarn, synthetic fibres, or glass fibres. (b) A paper, such as filler paper which has been reinforced by cloth, copper, or other material to prevent tearing at the punched areas. (c) Waterproof sheathing paper to which is bonded a continuous layer of a metal; the paper is a high effective moisture and vapour barrier and can be used as a termite shield. (d) A single-ply paper or board in which has been incorporated reinforcing material such as scrim.

Rejects Refiner: A type of refiner used to mechanically treat and refine rejected fibre from stock screening and cleaning operations in a pulp and paper mills.

Relative Humidity: The ratio of the amount of moisture in the air at any temperature to the amount required at that temperature to saturate the air.

Release Agents: An antisticking substance, such as soap, ammonia, glycols, etc, added to moistening fluid. It is used in the gloss-coating of paper on supercalenders to facilitate the release of the coating from the polished drying cylinder surface.

Release Paper: A group of paper specifically designed for easy stripping from or nonadherence to tacky surfaces. The types vary widely in from glassine or vegetable parchment to kraft papers and paperboards all of which are usually treated with a release agent such as a silicone, fatty acid metal complex, or acrylic polymer. Release paper are used for packaging wax, asphalt, rubber, certain foods, as backing for pressure-sensitive tapes and labels, and as casting surfaces for plastic films, etc.

Relief: The reduction of pressure in a pressurized vessel or process equipment by releasing some of the enclosed material. It is performed on such equipment as digesters, dryer drums, steam boilers, etc, for proper process operation or for safety purposes.

Relief Gas: Vapours commonly removed from batch-type pulp cooking digesters such as noncondensable gaseous components, in order to maintain proper temperature-pressure relationship during the cooking process.

Relief Paper: Paper with a suitable printing surface to permit the reproduction of an object to appear in relief. It is usually a highly finished coated paper.

Relief Printing: Printing from raised surfaces such as type, woodcuts, zinc and halftone plates as contrasted with intaglio work, such as copper and steel plates and lithography.

Relief Valve: A valve used to reduce pressure in a pressurized vessel or process by releasing some of the enclosed material. It can also a self-operated, quick opening valve.

Remote Control: A control system for automatically operating devices and valves located remotely on the process.

Rep Finish: A ribbed or corded finish or surface, somewhat like coarse linen or the weave of felt, produced by passing paper through grooved steel rollers or by felts with heavy warp threads or in platers in which the books are made up with rep cloth, which is similar to corduroy.

Reprint Paper: A printing paper used for reprints of books or other publications. It may be the same as the original paper used in the publication or of a higher or lower quality.

Reproduction Paper: Base paper used in various reproduction processes or systems. Such paper may be sensitized (as in the cases of white-print, negative, blueprint, photographic or zinc oxide coated) or plain (as in the case of electrostatic reproduction paper). It is generally made from bleached chemical pulps and/or cotton fibre pulps. It is usually very well sized and characterized by chemical purity, good wet or dry strength and a high degree of permanence.

Reprographic Paper: A type of sensitized paper used in reprographic copying machines based on different processes of reprographic. The base paper requirements are similar to that of sensitized papers.

Reprography: (a) A general term for office copying, etc, including the reproduction of printed, typed or handwritten material by processes other than printing or photography. This includes stencil printing, direct photocopying, xerography, heat copying and the like. (b) The applied physics and chemistry related to such processes of reproduction.

Reptissue: Lightweight tissue grades of paper with a ribbed surface.

Repulper: See 'Pulper'.

Repulping: The process of mechanically disintegrating and rewetting dry pulp and paper to form a slurry which can be treated further and reformed into a sheet of paper.

Reservoir: A natural or artificial pond, lake, tank or basin used for storage, regulation, and control of the mill water supply.

Reset Control Action: In process control, it is the number of corrections the control system makes per unit of time, usually expressed in minutes.

Residue: Material that remains after all gases, liquids, and solids are removed from mill effluents.

Resiliency: That property of a sheet which allows it to recover from a distortion of its shape.

Resin: A general term applied to various amorphous solid or semisolid organic substances insoluble in water but soluble in organic solvents, and classified as natural or synthetic. The natural resins are excretion or exudation products chiefly of plant origin (a familiar exception being shellac), fusible, usually yellowish to dark brown, and transparent to translucent. The chemical composition varies widely, but characteristic acids, esters and inert substances, termed resenes, are present together with extraneous fatty, mineral, or other materials. Gum resins that contain carbohydrate gums and oleoresins are mixtures of resins and volatile oils. The nonvolatile residue of the conifer resins is called rosin which is the most important natural resin used in the paper industry. Copal and dammar are natural resins employed in varnish.

Resin-Impregnating Blotting Paper: A paper into which resinous compounds are introduced. Such paper has the ability to absorb a considerable volume of these compounds and still retain a moderate wet strength. Frequently, this paper is required to be free from metallic conducting substances. It is made from either rags or chemical wood pulp or combinations of these, in a variety of thicknesses.

Resistance to Wear: That property of a sheet which withstands abrasion or more generally, changes in physical properties during use. Tests for evaluating resistance to wear are usually intended to simulate use conditions.

Resistivity, Electrical: The resistance to direct current between opposite parallel faces of a centimeter cube of the material. The electrical resistance of paper is often measured by passing a current through a square specimen between electrodes attached to opposite edges of the square. This leads to an expression referred to as 'Ohms per square'. This property is strongly influenced by the presence of foreign conducting particles and moisture, and is important in all electrical papers.

Retention: The percentage of filler or other materials in the furnish which remain in the finished paper or board.

Retention Aids: Materials, such as vegetable gums, cationic starches, potato starch, sodium aluminate, colloidal animal glue, acrylamide resin, etc, added to the papermaking process at the paper machine head-box, fan pump, or other location close to the wire.

They are added in small amounts for the express purpose of maximizing the retention of fillers by altering their electrical charge or bonding.

Retention Time: The elapsed period of time between when a material enters a process stage until it leaves it, such as chips through a continuous digester and pulp passing through various stages in a bleaching process.

Retree: The term applied to slightly defective sheets of paper to distinguish them from perfect sheets.

Rewetting Agents: Materials, such as sulphonated polyesters of dicarboxylic acid, used in the treatment of tissues toweling, and other wet-strength grades of paper to improve absorbency.

Rewinder: The term rewinder is often used for the winder in the finishing room, distinguishing it from the winder which follows the slitter at the end of the paper machine.

Rewinding: The operation of winding the paper of rolls received from the paper machine onto a core to give a tightly wound roll suitable for shipping or for use in the finishing or converting department. During rewinding, defective paper in the reel is usually removed and breaks in the sheet are spliced and marked.

Rheology: The science concerned with the deformation and flow of matter under the influence of various forces. The rheological properties of pigments and binders under the high shear forces of commercial paper and paperboard coating processes are extremely important to successful and economic operation.

Rheostat: An electrical device provided with means to vary its resistance to electrical current. It is used extensively in the mill to adjust motor speeds.

Ribbon Paper: A paper which is interwound with textile ribbons, such as silk or satin. The paper protects the ribbon and aids in keeping it in a roll that can be easily handled. It is made from chemical pulps with a machine finish, and it possesses good tensile strength. Colour and formation are not highly important factors.

Rice Paper: A misnomer for the sheet material cut from the pith of a small tree (*Aralia papyrifera*) which grown in the swampy forests of Taiwan. The cylindrical case of pith is rolled on a hard flat surface against a knife, by which it is cut into thin sheets of a fine ivory like texture. Dyed in various colours it is used extensively for the preparation of artificial flower; the white sheets are employed by native artists for water-colour drawing.

Rider Roll: A small sometimes counter weighted paper machine roll that is let down on a running sheet of paper of help maintain a pressure especially on winders after the paper has been turned around the core to give the sheet a better start.

Ridge: A paper roll defect appearing as rings around the circumference of the rolls. It is caused by the

non-uniform flow of stock from the headbox, plugged wet felt, plugged suction roll, faulty dryer canvas, buildup or filling of the calender rolls, etc. Sometimes known as bars, buckles, chain marks and rope marks.

Right Side of Paper: The side of a paper from which the watermark is read correctly. It is the wire side in handmade paper and the top of felt-side in machine-made paper.

Ringelmann Chart: A series of illustration ranging from light grey to black used to measure the opacity of smoke emitted from stacks and other sources. The shades of grey simulate various smoke densities and are assigned numbers ranging from one to five. Ringelmann No. 1 is equivalent to 20 percent dense, No. 5 is 100 percent dense. Ringelmann charts are used in the setting and enforcement of emission standards.

Ring Compression Resistance: See 'Ring Stiffeners'.

Ring Crush Test: The ring crush resistance of paper and paper board is the maximum compressive force that a test piece will sustain without being crushed, the test piece being in the form of a cylinder standing on one end and the force being applied to the other end under standard conditions.

Ring Grinder: A type of pulpwood grinder used to make ground-wood pulp. The logs are fed to the grindstone surface by a chain-driven, ring-type chamber and set eccentric to the grindstone, whose speed determines the rate of feed.

Ring Marks: Rings, clouds, or blotches in the colour in pigment-coloured papers, caused by the formation and breaking of bubbles on the surface of the stock on the wire.

Ring Porous Wood: Wood in which the pores (vessels) at the beginning of the growing season (in the spring-wood) may be more or less contiguous, forming a ring and in which the pores tend to be smaller and less conspicuous in the summerwood. Ring porous wood is characteristic of certain hardwoods.

Ring Stiffness: The resistance to edgewise compression of a short cylinder of paper or paperboard. It is also called ring compression resistance and is usually measured as the force in Newtons required to collapse the cylinder.

Ring Water: Dilution water injected in a number of locations around the periphery of pulp stock storage tanks and bleaching towers. It is injected just above the agitators and scraper arms to facilitate the removal of the pulp stock from the bottom by stock pumps.

Ripple Finish: Originally a plater finish made by plating paper between sheets of sulphite pulp with a crushed formation. The result was an undulated glossy finish with the resulting indentations darker in colour than the higher spots. More recently, this finish has been obtained by passing a continuous web of paper

(a) through the nip of two embossed steel rolls, one male and one female or (b) through the nip of one steel embossed roll and one rubber plastic, or paper backing roll.

Rice Time: The elapsed time required to achieve top operating temperature and pressure by steam-heating a batch-type digester in a pulp mill.

Roe Chlorination Number: A value determined by a pulp mill laboratory test on pulp to indicate the quantity of gaseous chlorine absorbed by a specified sample. It is a measure of its bleachability.

Roll: (a) A continuous sheet of paper or paperboard wound up around a core or shaft, usually to specified diameter and width to best suit subsequent finishing and converting operations. (b) A rotating cylindrically shaped, solid or hollow structure made from a variety of materials. It is normally used in a horizontal position to support or carry paper of other sheet materials, such as felt, on a paper machine. They may be driven or rotating by the sheet they support, or they may be independently driven.

Roll Box: A small vacuum suction box sometimes located just behind the breast roll on the wet end of a paper machine. It is used to remove air and water from the returning wire in order to aid in stabilizing the stock flow jet from the slice, and to minimize the tendency to form bubble marks in the sheet.

Roll Coating: A process in which coating colour is applied to either one or both sides of a paper web by transfer from a rubber applicator roll onto which the coating colour has been metered. This process may be carried out on or off the paper machine.

Roll Doctor: A scraping device in the form of a thin blade in contact with and extending across the face of paper machine rolls, usually to keep the surface clean. Also called a doctor or doctor blade.

Roll End: A protective circle of an appropriate material (usually paper-board) used for protecting a paper roll from damage during shipment.

Roll Grinding: The machining of paper machine press and calender roll surface to obtain the proper crown profile consistent with good performance operation.

Roll Heading: A manual or automatic operation during roll wrapping of paper in which the folded end wrapping is covered with a piece of material (roll end) and attached to it for protection during shipment.

Roll Out Table: Roller type conveyors used in structural board manufacturing to transport the wet, pressed sheet to the dryer.

Roll Paper: Paper in rolls of any required width and diameter.

Roll Set: A curd in paper caused by the tendency to conform to the curvature of the reel or of the core on which the paper is wound.

Roller Back: An operation performed in a groundwood mill in which a blank or dull burr is run across the grindstone face to knock off the high points.

Rolling Bearing: A friction support assembly commonly found in pulp and papermaking machinery. It consists of a journal-type socket fitted with rollers on its interior perimeter.

Roof Air Supply: Warm air introduced under the roof of a paper machine room to prevent condensation and dripping.

Roofing Felt: A very porous, soft paper, made largely from the lowest grades of old cotton and woollen rags and some old paper stock, the quality depending on the nature and quantity of rags used. The rags are beaten as quickly as possible, in as much as the freest possible sheet is essential. It is generally made on a single-cylinder machine, although it may be made on a fourdrinier machine. No sizing or loading is used. It is used as a base for saturating in the manufacture of roofing papers.

Roofing Paper: A general term used to designate any material used in waterproofing upper decks of building. There are several varieties: (a) Prepared roofing; felts saturated and coated with asphalt, plain or crushed slate or other grit, embodied in an asphalt-coated surface. (b) Built-up roofing; felts saturated but not coated with asphalt; used in plies or layers and coated or built up at the time of application. (c) Roofing shingles; Prepared roofing cut into various sizes and styles of shingles.

Roofing Rags: Used rags consisting of cotton and wool garments, etc, employed in the manufacture of dry felt. Several grade are recognised.

Roofing Shingles: Prepared roofing cut into various shapes generally composed of roofing felt saturated and coated on both sides with compounded asphalt coating and surfaced on the weather side with mineral granules.

Rope: A large, stout cord made of the fibres of hemp, manila hemp, sisal jute, coir, flax, or cotton, manila hemp and sisal being most commonly used. Old rope is used as raw material for certain types of paper, especially rope papers. Some ropes are made from synthetic fibres. They are not suitable for paper making.

Rope Armature Paper: A clean strong paper sheet of high-dielectric strength used as insulation in the manufacture of electric motors.

Rope Carrier: A system developed to safely thread the sheet of paper through the dryer section of a paper machine. It consists of two ropes running in grooves on the tending side of the dryer drums. They run

together and carry the sheet through the dryer when fed into the nips of the rope.

Rope Marks: Diagonal welts appearing in a web drawn from a roll of nonuniform hardness, the welts being formed in paper from the area of the roll that is softer than the areas on either side of it.

Rope Paper: Any paper made from manila hemp or gunni hemp (commonly called rope). It may be composed entirely of rope fibres or it may contain some chemical pulp. Such papers are made on both cylinder and fourdrinier machines in practically all weights and thicknesses. They are used as cable papers, shipping tags, saturating papers; and for other purposes where strength is an important property.

Rope Sack Paper: A paper used for flour, food, pigment, and rock products. It is made of rope pulp, or in some instances, fixed with a percentage of chemical pulp. It may be enamel coated and may have a blue lining.

Rope Wrapping: A term for a strong paper in brown colour made from hemp or a combination of hems and chemical pulp. It is used in wrapping especially in the hardware trade.

Roping: The longitudinal wrinkling of a web of paper caused by tension as the web is drawn over the drying drums and also by the tendency of the web to creep transversely upon the drum surface.

Rosin: The residue obtained after distilling off the volatile matter (turpentine) from the gum which exudes from the pine tree. Wood resin is that prepared from pine stumps or other resinous woods by the steam and solvent process. Rosin is the commonly employed material for internal (beater) sizing. It mainly contains Abietic acid, generally indicated by $C_{19}H_{29}COOH$.

Rosin Size: An emulsion of rosin soap with or without free rosin in emulsion form in water, used for sizing paper and paper board to impart water resistance. Although rosin size is a soap, yet cannot be used as a substitute of soap for washing of textiles.

Rosin Specks: Translucent, amber-coloured specks of rosin in paper caused by the incomplete emulsification of the rosin size or by precipitation of the size before it is uniformly dispersed in the stock.

Rotameter: A fluid meter device consisting of a vertically oriented, tapered tube in which a floating element rides in a stream flowing through it, rising and falling in accordance with the velocity of the moving stream. The tube is calibrated with a scale so that the position of the floating element is indicative of the flow rate.

Rotary Digester: A cylindrical or spherical drum used to cook rags. It is mounted on trunnions resting on bearings at each end, about which they slowly revolve during the cooking process.

Rotary Drainer: Revolving cylindrical screening equipment through which freshly cooking pulp is passed so that the spent cooking liquor drains away and is followed by a dilution and washing operation.

Rotary Lime Kiln: A refractory-lined, open-ended, inclined steel cylinder located in the lime recovery area of a pulp mill. It is mounted on rollers on which it is rotated about its longitudinal axis. Lime mud (CaCO_3) is fed in the higher feed end and burned to form lime (CaO) as it travels to the lower discharge end.

Rotary Newsprint: Newsprint in roll form for use on rotary printing process.

Rotary Pressure Joint: A type of steam supply connection designed for getting steam into rotating vessels, such as rotary digester, or getting condensate out of paper machine dryer drums and other similar equipment.

Rotary Printing Paper: A paper used on rotary printing presses. The term indicates that the paper is delivered in rolls; any grade of paper meeting specifications required for the subject matter to be printed may be used. Tensile strength and uniformity of quality are important.

Rotary Pumps: Types of fluid-moving devices commonly used in mills for moving chemical solutions and other liquids through pipelines. They are characterized by having a rotating cam, screw, gear, or vane as the moving element, fitted into a suitable fixed casing.

Rotary Screen: (a) A stock-cleaning device used just ahead of the paper machine to remove dirt by passing the slurry slowly through a rotating cylinder mounted with fine-slotted plates, which are constantly scoured by a shower. (b) Any type of pulp screening equipment in which the screening chamber or drum is rotated or revolved.

Rotary Syphon: A specially designed piping system designed to scoop condensate from the inside of rotating paper machine dryer drums and to remove it through a rotary pressure joint.

Rotary Vacuum Filter: A type of pulp washer consisting of a revolving wire-covered, cylindrical drum, partially immersed in a vat of low consistency stock slurry. The slurry forms a mat on the outer surface of the drum as liquor drains away from the mat and down a drop log to create a vacuum while wash liquor is sprayed on the drum.

Rotoformer: A paper-forming device used to manufacture single or multi-ply grades of paper and paperboard. It consists essentially of a wire-covered drilled shell on which the stock is formed suction boxes inside the shell to remove water, and a restricted forming area in the upper quadrant of the upturning side of the cylinder.

Rotogravure Paper: A general term used to describe paper manufactured for rotogravure printing. The outstanding characteristic of the paper is the highest possible printing sometimes for both coated and uncoated grades. Consequently, a supercalendered sheet is frequently used although english finish and machine finish papers and also used. The term rotogravure paper is in general may be applied to a variety of coated or uncoated grades ranging from paper containing no mechanical pulp to one containing a substantial proportion of mechanical pulp.

Rotogravure Printing: An intaglio printing process for rotary web presses, which is used by newspapers and magazines, for printing catalogues, and also for much specialty and paper converting. A photographic positive is prepared one film and is printed upon sensitized gelatin paper (carbon tissue). A reversed lime screen is then printed over the picture and the so-called carbon resist is ready to be transferred to the cylinder. The tissue is dampened and rolled onto a copper cylinder or plate to which it adheres. After drying, the tissue receives a flow of warm water which loosens the paper backing, leaving the gelatin film on the copper surface. In the shadows or dark tones this film is very thin, the thickness increasing as the tone lightens, so that the etching solution penetrates the film more quickly where the 'Cups' are to be etched deeper as in the shadows or tones. The etched copper cylinder is finally inserted in position on the press. In recent year, instead of using solid copper cylinders which can be reground and re-etched, the design has been etched on flat sheets of copper which are later curved and fitted to a permanent plate cylinder.

Rough: Paper in which little or no finish is applied to the surface by the paper machine calenders.

Roundwood: While tree trunk sections which are harvested for commercial uses such as lumbar or pulpwood.

Rubber Mark: A pattern imparted to the paper during manufacture on the machine by passing the wet web through a marking press.

Rubber Spots: Dirt specks in paper, composed principally of rubber. They originate (a) in rag-content papers from plastic yarns in the rags or cuttings used; (b) in papers or paperboard containing reclaimed paper stock, from latex type adhesives used on mailing labels, etc, present in the waste paper furnish.

Rubber Stamp Mark: A mark simulating a watermark but impressed in the wet web of paper by a rubber band on the press rolls or baby drier, usually on high-speed machines.

Ruling and Writing Qualities: Ability to accept lines ruled with ink or characters written with a pen (not ball-point) without feathering or other distortion of the marks.

Runnability: (a) In the paper mill, how well pulp stock furnish to the paper machine forms a sheet on the wire and passes through the drying and finishing operations. (b) Used by customers in reference to how well the paper performs in their converting operations, such as on printing presses.

Rupkari: A hard supercalendered paper used in making Indian style account books.

Rush Drag Ratio: See 'Efflux Ratio'.

Ream Wrappers: A hard sized, strong paper used in wrapping reams of paper. It is sometimes asphalt or wax laminated and may be polyethylene coated. In addition to holding the contents intact and protecting against contamination, the wrapper frequently must provide protection against excessive changes in moisture; therefore, low moisture vapour transmission properties may be required.

S

Sack Kraft Paper: A strong packing paper used for making kraft paper sacks.

Sack Paper: Any paper used in making sacks, usually stronger and heavier than bag paper. It is made from hemp or kraft pulp or mixtures of these.

Sacks Paper Shipping: Paper shipping sacks are flexible containers; they are flexible in the sense that they may be made in a variety of constructions to fit variations in content, and shipping at storage conditions. Paper shipping sacks are made from one to six plies or walls of shipping sack kraft paper often in combination with special coatings or laminates. In multiwall sacks (sacks of three or more plies), greater flexibility and strength, are obtained by using several walls of relatively light weight, rather than a few walls of heavy paper. Because of wide variety of commodities shipped in multi-wall sacks, many special coating are employed to meet specific use requirements, such as those providing moisture, grease, and scuffing resistance as well as release properties to prevent the contents from sticking to the paper. Paper shipping sacks are custom made and are designed to meet each individual packer's requirements for strength and quality product protection.

Safety Paper: A special grade of paper having a surface design or hidden warning indicate or both of such chemical composition as to make obvious any attempt at fraudulent alteration of the writing thereon by ink eradicators, mechanical erasure, etc. It is used for bank cheque, coupons, money orders, lottery tickets, trading stamps, transportation tickets, and other paper items having a negotiable value. Safety paper is made by either a wet or dry process. In the wet process the surface design is applied to the paper by immersing it in a dye bath and then removing the

excess dye solution usually by passing the paper through a press comprising one steel engraved pattern roll and a rubber composition backing roll. Wet process safety papers have a positive surface pattern on one side and a reverse pattern on the other. Such papers must be dried after processing. In the dry process the surface design and warning indicia, if any are applied by a flexographic press employing spirit-soluble inks or dyes. Dry process safety papers can be produced with positive-reading patterns on both sides of the sheets, with positive and negative patterns on the top and bottom of the sheet, or with multi-colour or multi-pattern combinations of the two. Dry process safety papers require little or no drying during conversion because of the fact that alcohol instead of water is the principal ink (that is dye) solvent.

Safety Paper Base Stock: A typical bond or writing paper which may or may not be treated with chemicals sensitive to chemical ink eradicators. It is usually made for surface treatment with sensitive inks by a printing process or with sensitive dye-stuffs applied with a device to produce various designs or patterns. The paper has typical bond properties with good strength, especially fold and tear, uniform formation, and smooth surface.

Safety-Ticket Paper: A grade of paper or paperboard having special surface markings or containing uniquely reacting material to permit authentication and thus minimize forgery. Multiply board is often used with differently coloured or reacting plies.

Safety Valve: A self-operated, quick-opening, spring-loaded valve used for fast relief of excessive pressures in process equipment and enclosed vessels, such as on power and recovery boilers, and to relieve pressure during emergency conditions to protect drums boilers, etc.

Saleable Mass: The gross mass multiplied by the absolute dryness multiplied by the defined commercial dryness called air-dry mass.

Sales Book Manila: A grade of paper used in sales books and order books. It is usually made from a furnish containing considerable mechanical pulp, in a manila colour, though frequently other colours, such as canary, pink, green, blue and salmon are used.

Sales Book Paper: A term applied to various grades of paper used in the manufacture of sales books and order book which are used in wholesale and retail stores. The various grades are Carbon paper, Poster, Railroad, Manila, Register bond, Sales-book manila, and sales-book tissue.

Sales Book Tissue: Tissue used for the carbon copies in sales books and forms of various kinds. Generally it is made on a fourdrinier machines from bleached or unbleached chemical pulps and is well sized so that paste will not strike through when the sales books are

made. The pulp is well beaten and the paper is translucent but should not curl when cut into small sheets.

Salt Cake: A form of anhydrous sodium sulphate (Na_2SO_4) added to the thick black liquor just prior to incineration in a sulphate recovery furnace where it is converted to sodium sulphide (Na_2S) to provide one of the active chemical in the subsequent makeup of raw cooking liquor in the sulphate pulping process. Also referred to as Glauber's salt, when it is in crystalline form $\text{Na}_2\text{SO}_4 \cdot 24\text{H}_2\text{O}$. It is found as natural deposits and is also produced as a byproduct in several chemical industries like rayon.

Salt Cake Makeup: The sodium sulphate (Na_2SO_4) that has to be added to the alkaline black liquor during the chemical recovery cycle to provide the desired level of active chemical. It is expressed in kg. per tonne of air dry pulp produced.

Salt Cake Mix Tank: A specially agitated tank through which black liquor is passed so that sodium sulphate can be added to it just before incineration in the chemical recovery furnace.

Salting Out: The formation of layer of fat and resin acids present in sulphate black liquor as soap due to the increasing salt content caused by the evaporation process. It is removed so that it will not plug the evaporator tubes.

Sample Cards: Cards made from bristols or cardboard used for display purposes by pasting thereon samples of commodities offered for sale.

Sampling: The selection of a group of specimens for analysis or testing to verify the quality of the material as claimed or required.

Sampling Paper: Paper used for wrapping samples of cotton, wool, etc. It is made hemp sulphate, or sulphite pulp and furnished in natural colour and in duplex, the duplex sheet is usually blue and white.

Sand Table: Troughs or channels through which a very dilute suspension of stock flows to eliminate the heavy impurities from the suspension by gravity, for which purpose they are sometimes fitted with suitably arranged submerged baffles.

Sandwich Paper: Usually a waxed, bleached chemical pulp sheet, white in colour, although a waxed or unwaxed glassine or a vegetable parchment paper may be used. As the name implies, it is used in wrapping sandwiches and for making sandwich bags.

Sanitary Landfill: A site for solid waste disposal using sanitary landfilling techniques.

Sanitary Tissue: Any of a group of papers used for sanitary disposal purposes. Generally those papers are absorbent, bulky, and have a rough finish. Included in these papers are facial tissue, paper napkins, toilet towels and the like.

Sanitary Wall Paper: A variety of wall paper printed from engraved or etched copper rolls with oil inks. It may or may not be washable.

Sap: The fluid part of a tree that moves up from the roots through the outer portion of the trunk and branches and contributes to its growth.

Saponification: The conversion of fatty acids to soaps by treatment with alkalies, as used in the manufacture of rosin size employed in papermaking. Also called rosin soap. This same phenomenon occurs when the alkali in sulphate cooking liquor reacts with the fatty acids in wood during the cooking process.

Sapwood: The outer living portion of a tree root or branch, through which water is conducted; it is usually distinguished from hardwood by its lighter colour. The parenchyma or ray cells, remain alive in the sapwood.

Satin Finish: A smooth finish of paper or bristol, suggestive of satin.

Satin Paper: A term used for mica paper.

Satin White: A filler produced by the interaction of aluminium sulphate and slaked lime. It is used as a pigment in coating mixtures, particularly in coated paper of high white colour requiring an enamel finish.

Saturated Air: An air-water vapour in which the pressure of the water vapour equals the vapour pressure of liquid water at the temperature of the mixture.

Saturated Felt: A porous, bulky felt sheet made from wood fibres, paper and low-grade rags and saturated with tar or asphalt.

Saturating Felts: A term applied to those dry felts which are used as vehicles to carry and hold various tars, asphalts, or other water-proofing compounds. They are sometimes designated as waterproofing felt and form the base for roofing papers, etc.

Satchel Bag: A gusseted tube with the bottom closed by turning up this tube and gumming the turning up to the outside of the bag so formed.

Saturating Papers: Open, porous papers that are to be saturated or impregnated with solutions or compounds of various types.

Saturating Properties: The properties of an impregnating paper that determine the quantity of impregnating materials that the paper will take up and the rate of impregnation. For roofing felts, saturating capacity and saturation rate are used to evaluate these properties.

Save All: An equipment used for reclaiming fibres and fillers from white water. It usually operates on a filtration, sedimentation, flocculation, or flotation principle.

Sawtimber: Commercial tree species having such dimensions as to warrant cutting for timber. Generally

speaking such trees should be at least 11" in diameter, breast-high.

Scabbing: The adherence and buildup of foreign material on the surface of paper machine calender rolls which are usually scraped off and kept clean by the use of doctor blades.

School Drawing Paper: A grade of drawing paper used in school work. It is manufactured from a mixture of mechanical and chemical pulps. The usual colours are white, gray and manila.

School Flats: Tablet paper manufactured with a high finish for pen and ink writing. It is usually ruled.

School Papers: A term covering the various types of papers used in schools colleges, universities. School papers include such items as typewriting, mimeographing, and duplicating papers; ruled writings such as tablets, copybooks, composition books, loose leaf notebooks, etc; drawing papers of all kinds; construction paper; cross section profile, logarithmic, and other papers of this type; index bristols in the form of cards; stenographer note-book, etc. These are supplied in various grades and weights, depending upon their use.

Schweizer's Reagent: See 'Cuprammonium Hydroxide'.

Score Crack: A crack originating at or near a score or crease in paper board or heavyweight paper.

Scoring: The production of a score or crease in a sheet of heavy-weight paper or paperboard by pressing it between two metal surfaces, one of which has a recessed groove and the other a tongue. The score may be produced by scoring plates or by scoring rollers and is made along the line on which the sheet is to be folded. It alters the sheet structure in such a way that it will fold more readily with less tendency to crack or break.

Scrap in Roll: Trim or scrap paper wound into a roll.

Scratted Paper: (a) An early form of wallpaper. (b) A cheap imitation of marbled paper, prepared by 'Spirting' or spotting various colours on paper by means of a brush. It is used for lining boxes, for end leaves, etc.

Screen: Equipment that separates desirable material from undesirable material by the principle of filtering through a perforated plates or mesh. Examples are screening sawdust from chips and dirt from pulp suspensions. It is used for white water cleaning, dewatering and fibre recovery processes.

Screen Printing: A stencil printing process in which ink point is forced through the fine meshes of a special silk or other material by means of a squeeze onto the surface to be printed directly beneath the screen. Most of the screens are hand prepared; in the hand-blocked screen the design is traced on the silk and all parts not to be reproduced are painted out with a filler; in the

hand-cut type the outline of the colour to be painted can be cut out of transparent paper or cellulose acetate film and applied by heat on the underside of the screen. Fine-line cuts and halftone subjects can be photographically rendered as stencils by first applying a sensitized coating to the screen. The process may be used for advertising displays of all kinds and for the printing of dress goods, draperies, wallpaper and the application of trade-marks and designs on all kinds of manufactured articles. It is usually used for short runs (store cars, etc) but there is an automatic press for printing screen work at speeds up to 1 800 impressions an hour.

Screen Residue: Dirt, fine materials uncooked chips and knots retained on the screen through which chemical pulp is passed as it comes from the storage tank.

Screen Room: The area in a pulp mill where unwanted particles called tailings or rejects are separated from the accepted fibres with the use of equipment such as knotters, refiners, separators, thickeners and flat or rotary screens.

Screenings: Rejected materials such as knots, shives, and large bark particles, from the screening operations of pulp suspensions in a pulp mill. This material is either dried and burnt, or used in the manufacture of coarse wrapping papers or insulating boards.

Screening: The process of separating undesirable sawdust, fines, and oversize chips from acceptable chips, or separating unacceptable dirt, fibres, shives and knots from acceptable pulp in a pulp and paper mill by the use of screens.

Screenings Board: A paperboard made of pulp screenings and used as a mill wrapper. It is strong and sufficiently pliable to be formed about the edges of a bundle of paper.

Screw Chip Feeder: A chip-feeding mechanism used to feed chips into continuous-type digesters under pressure. This is accomplished by the formation of a plug of chips compacted with a screw-type impeller.

Score: A light incision partially through the thickness of a board, usually to facilitate folding.

Screw Conveyor: A short-distance material mover used in a pulp and paper mill. Its primary moving element is a rotating spiral which pushes solid material, such as pulp, chips, sawdust, coal, etc, from one point to another. Also called spiral conveyor.

Screw Press: Liquid extraction equipment used to squeeze chips prior to refining in the manufacture of mechanical pulp.

Scribbling Paper: A low grade of tablet paper used for student practice writing, longhand calculations, scratch pads, etc.

Scrubber: A device that used a liquid spray to remove pollutants and solid particulates from a gas stream by

absorption or chemical reaction. Scrubbers also reduces the temperature of the emission.

Scrubbing: The removal of impurities from gaseous mill effluent by the use of a wash liquid, usually in the form of a spray.

Scuff Resistance: The resistance to scuffing of paper or paperboard, usually measured in terms of the number of cycles required to produce a designated degree of scuffing on a designated area with a designated abrasive object of designated size and weight rotating or reciprocating at designated speeds.

Scuffing: The raising of the fibres on the surface of a paper or paperboard when one piece is rubbed against another or comes in contact with a rough surface. Paper and paperboard are more susceptible to scuffing when wet.

Seal Tank: A receiving tank located beneath vacuum-type washers and filters. The water drops into it through a pipeline and forms a seal to create a vacuum in the sheet forming cylinder portion of the unit. Sometimes referred to as a Seal Pit.

Seal Water: A water purge added to the packing gland of a pump or other rotary joints for the purpose of lubrication, cooling and to prevent process fluids from coming in contact with the packing the packing gland.

Sealability: That property of a paper or paperboard which renders it capable of being sealed by adhesives, heat, pressure, or other means.

Sealing Paper: (a) Thin sulphite or kraft machine glazed wrapping papers used as parcel wrappers manufactured in various substances and colours. (b) Heavy mill wrappers of chemical pulp, with a high finish sometimes duplex in colour, used for sealing ream packages of book or writing paper.

Sealing Tape: A strong gummed paper used for sealing purposes.

Seaming Cord: A twisted kraft paper twine made in a variety of sizes and used for welting and seaming upholstery work.

Seasoning: Exposure of paper or board to relatively uniform conditions of atmospheric temperature and humidity, to allow its moisture content to reach equilibrium with the atmosphere and become uniformly distributed throughout the sheet. *See also* 'Maturing'.

Second Press: The second set of press rolls through which the wet sheet or paper passes after leaving the first press section of the paper machine.

Second Sheets: (a) A paper used where one or more carbon copies of the same letter or writing are desired. It is made in various colour and frequently in lighter weight than the ribbon sheet. (b) A paper of the same character as the letterhead used but without printing or simply carrying the name of the firm. It is used for the continuation of a letter requiring more than one page.

Secondary Black Liquor Heater: A heater in the black liquor feed system of a sulphate recovery furnace, located between the discharge of the black liquor nozzle pump and the black liquor spray nozzles. It is used to raise the temperature of the black liquor, usually by direct contact injection steam or by indirect heat exchanging.

Sealing: A method of providing additional security to a wrapping or container with the object of retaining the contents and protecting them against factors causing deterioration or loss.

Secondary Colours: Colours, such as green orange, and violet, which are obtained when two of the primary colours (red, yellow, and blue) are mixed together.

Secondary Pulp: Fibre suspensions from repulping waste-paper broke and other reclaimable fibre sources (called secondary fibre).

Secondary Stock: Fibres which have been previously used in the paper making process. The term includes paper stock reclaimed from waste papers as well as wet or dry broke.

Secondary Treatment: Wastewater treatment, beyond the primary stage, in which bacteria consume the organic parts of the wastes. This biochemical action is accomplished by use of trickling filters or the activated sludge process. Effective secondary treatment removes virtually all floating and settleable solids and approximately 90 percent of both BOD and suspended solids. Customarily, disinfection by chlorination is the final stage of the secondary treatment process.

Secondary Wastewater Treatment: The treatment of wastewater by biological methods after primary treatment by sedimentation.

Seconds: Paper which is inferior to the established standard quality but which is marchentable at some lesser value. Also *see* 'Retree Paper'.

Sectional Drive: The use of individual electric motors to run the various sections of a paper machine. They are adjusted and regulated to achieve the necessary related speeds for proper operation.

Sectional Linen Finish: A linen finish obtained by passing two or more sheets paper which are contained between two linen sheets and in turn between zinc plates or pressboards through a plater. If only one sheet is used, a Lawn finish is obtained.

Seam: A line of junction of the edges of flaps and/or a container at which the sealing of the closure is affected.

Security Paper: A paper with bond characteristics similar to currency paper. It is used for stocks, bonds, and other securities, and it is usually made for engraving by the wet intaglio process. It may contain

distinctive features and safety features to protect against counterfeiting. *See* 'Safety Papers'.

Sediment: Any material that settles out of pulp slurries, liquid solutions treated water, wastewater, and other fluids.

Sediment Value: A measure of the rate of settling, varying with the different fibres or pulps and the fibre length.

Sedimentation: The process of subsidence and deposition of suspended matter carried by water, wastewater, or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material. Also called settling.

Sedimentation Basin: A basin or tank in which water or waste-water containing settleable solids is retained to remove by gravity a part of the suspended matter. Also called sedimentation tank, settling basin, settling tank.

Sedimentation Tanks: In wastewater treatment, tanks where the solids are allowed to settle or to float as scum. Scum is skimmed off; settled solids are pumped to incinerators, digesters, filters or other means of disposal.

Seed Fibres: Fibres which grow attached to the seed coat, such as cotton.

Seed-Germinating Paper: A blue absorbent paper which does not bleed or run when wet. It is used by seedmen as a medium upon which to grow seeds for the purpose of determining the percentage which will germinate. This paper is usually made of a mixture of cotton and chemical pulp, and it is free of chemicals injurious to seeds.

Self Adhesive Paper: Paper either plain or coated to which a pressure sensitive adhesive has been applied.

Self Sealing Paper: Paper with a special adhesive coating that allows it to adhere to other sheets or to other surfaces by the use of pressure.

Self Sealing Wrapper: Wrapping paper coated on both surfaces so that, when two parts of a sheet are pressed together and heated or pressed the overlapping parts become sealed together. Wax, rubber, or thermoplastic materials may be used in the coating operation.

Self Skinning Rolls: Paper machine rolls that characteristically possess the property of easy sheet release due to special microporous neoprene coverings which introduce air between the roll surface and the sheet. Sometimes referred to as self-doctoring roll.

Semibleached Pulp: Pulp which has been only lightly bleached to what is originally considered a very low brightness range.

Semichemical Board: A paperboard, usually corrugating medium, made from pulp produced by a semichemical process.

Semichemical Mechanical Pulp (SCMP): Pulp made by pretreating the chips with chemical at a temperature over 100°C and then refining them at atmospheric pressures.

Semichemical Pulp: A papermaking pulp produced by a mild chemical treatment of the raw material followed by a mechanical defibreizing operation. The term is commonly applied to papermaking fibre produced by the neutral sulphite process or chemomechanical pulp (CMP) and such pulp is called neutral sulphite semichemical or NSSC pulp. End uses include medium for containers.

Self-Adhesive Tape: *See* 'Pressure-Sensitive Tape'.

Semichemical Pulping Process: A two-step pulping process which uses a mild liquor, such as neutral sodium sulphite/sodium carbonate solution, for practical softening of chips, followed by a final separation of fibres by mechanical action. In this case, it would be referred to as a neutral sulphite semichemical (NSSC) pulping process.

Semicrepe Tissue: A tissue or lightweight paper that resembles crepe but which lacks the characteristic stretch and strength. It is used for napkins, paper towels, tablecloths, toilet paper, etc.

Sensible Heat: The energy required to change only the temperature of a material.

Sensitized: Treated with chemicals that change colour on exposure to light, heat, or chemicals.

Sensitized Papers: A general term for papers which have been coated, impregnated or otherwise treated with chemicals to render them responsive to light, heat, moisture, erasure, reagents, etc. Examples are safety paper, photographic paper, blueprint paper, diazotype paper, etc.

Sensitizing Papers: A generic term applicable to base papers used for various sensitizing processes, as for example, photographic base, blueprint base, etc.

Sensor: An element or device directly responsive to the value of a process measurement quantity.

Sepiate Fibre: Pulpwood fibres that contain cross walls.

Sequestering Agent: Any chemical used to stabilize other chemical solution, such as using magnesium sulphate ($MgSO_4$) to stabilize hydrogen peroxide bleaching liquor or to control the brightness and reversion effects of iron salts formed during the pulp-bleaching process. A type of chelating agent.

Serpentine Paper: A fairly strong, medium weight paper, generally made from chemical pulp or with mechanical pulp. It is made in a large variety of colours and put up in small rolls about 9.5 mm (3/8 of an inch) wide. It is used on festive occasions for throwing and decorating purposes and is often made flame resistant.

Set Point: A manually or automatically set input variable to a process control system that sets the desired value to which the measured process variable is to be maintained.

Setup Boxboard: Paperboard used in making boxes in rigid form as contrasted with a folding or collapsible box. It may be a solid or combination board depending on the style of box. Stiffness, rigidity and resistance to abuse are essential qualities. The class includes plain chip-board, filled newsboard, single news vat-lined chipboard and single white vat-lined chipboard.

Setup Boxes: Boxes which are manufactured in the form and shape in which they are to be used, as distinguished from folding cartons which are manufactured in a collapsed form and not set up until used.

Shade: (a) To examine similar specimens and separate into groups of essentially of identical colour. (b) Lightness difference between surface colours whose other attributes are essentially the same (Shade is derived from shadow and so should theoretically apply only to change towards darker colour, in practice reference is made to lighter as well as darker shades).

Shadow Mark: See 'Couch Mark'.

Shadow Water Mark: See 'Intaglio'.

Shaft: (a) A rotating, cylindrically shaped, solid rod or bar which is equipped with rotating pieces or pulleys for the purpose of transmitting power or motion in mill machinery and operations. (b) A metal wood or convolute-wound fibre tube used to wind paper or paperboard into rolls for transporting or shipping purposes. Also called a 'Core'.

Shake: An accentric stroke device driven by a variable speed motor and connected to the wire section of slower speed paper machines move the wire section from side to side, then improving the orientation of fibres during the formation of the paper web.

Shavings: (a) A class of reclaimed paper stock, consisting of un-used, unprinted trimmings and other waste from converting operations. Sized white writing paper shaving free from mechanical pulp are called hard white shavings. Book paper shavings are called soft white shavings. (b) The narrow strips of paper with deckle edge, trimmed off the edge of the web by the slitting knives of the roll winder or sheet cutter.

Shear: (a) The hydraulic cuttings blade on a mechanical pulpwood harvesting machine. (b) A refining action that results in two contiguous parts of the fibre sliding past each other, in a direction parallel to their plane of contact. (c) The cutting action of the impeller of a pump as it passes through the material trapped within the casing, particularly at the cut water point.

Shear-Type Agitator: A type of agitator that not only mixes various emulsions, solutions and pulp suspensions in pulp and paper mills, but also breaks up the particles.

Shearing: A refining action which results in two contiguous parts of the fibres sliding relative to each other in a direction parallel to their plane of contact.

Shearing Strength: The maximum shear force required to produce failure in a paper or paperboard member. The shear force is the internal force acting along a plane between two adjacent parts of a body when the equal forces, parallel to the plane considered, act on each part in opposite directions.

Sheathing: A type of fibre board manufactured in various sizes and thickness and used in building construction as a structural and/or insulating material.

Sheathing Paper: A paper used between rough boards and finish in outside walls of a frame building. The paper is closely felted and relatively compact to provide protection against wind and dust.

Sheave: A grooved wheel, usually found on a pulley or the wheel in which the rope or belt rides in a paper machine drive assembly.

Sheet: A term used extensively in the paper industry meaning: (a) a single piece of pulp, paper or board. (b) The continuous web or paper as it is being manufactured. (c) A general term for a paper or board in any form and in any quantity which, when used with a appropriate modifying words, indicates with varying degrees of specificity, attributes of the product such as quality, class, use, grade or physical properties, *Examples:* A bright sheet, a kraft sheet, a folding boxboard sheet. (d) To cut paper or board into sheets of desired size from roll or web.

Sheet Calendered: The result of a process of applying a finish or glaze to sheets of paper or paperboard by passing them through a calender stack (but not in a continuous web) with the aid of a sheet feed gear. The stack consists of three to five rolls, chilled iron and cotton rolls are alternated in the stack.

Sheet-Fed Printing: The process of printing on material that is fed into the press in the form of individual sheets instead of rolls.

Sheetage: The number of sheets of a given size that can be obtained from a reel of a given weight.

Sheeting: The process of cutting sheets from a web or roll of paper.

Shift: A period during a day in which a crew of operating personnel work. In a 24-hour pulp and paper mill operation, there may be 3 or 4 shifts of 8 to 6 hours in length, with a new crew taking over each period. Also called a tour.

Shiner: (a) A glossy fibre bundle occurring in mechanical pulp or in an undercooked chemical pulp. (b) Particles of fillers which are compressed to a translucent spot upon through the calenders.

Shipping Container: A box made of corrugated board or solid fibreboard used as an outer container in the shipment of commodities.

Shipping Sack: Single-wall, double wall or multiple wall (3 to 5 walls) sacks constructed of shipping sack

paper. The paper may be modified in various ways by coating, lamination, or impregnation. These sacks are used for the packaged shipment of a large variety of agricultural and food products, chemicals, building materials, minerals, pigments and the like. The sacks are custom made to the individual specifications of the packer and shipper.

Shipping Sack Kraft Paper: Paper manufactured of kraft pulp against specifications which take into consideration the high strength or requirements of the completed multiwall shipping sack. This paper must not only protect the contents of the filled multiwall bag during transit, storage and subsequent handling but must also withstand high stress during commercial bag filling operations. This paper is not to be confused with bag kraft used for the manufacture of grocery bags and sacks.

Shives: Coarse fragments of fibrous materials present in the pulp and resulting from incomplete resolution during pulping.

Shoe Board: A fibreboard formed from a single web on a wet machine from virgin pulp, reclaimed paper stock, leather waste, or other waste materials, or a combination of such materials, with or without the addition of chemicals. To meet the different requirements needed for different kinds of shoes, shoe board is produced in a range of characteristics achieved primarily by changing the material blend in the board. Depending upon their end use, shoe boards may be termed counter-board, heeling board, innersole board, leather fibre, leather board, midsole board, reinforcement board, shank board, or tuck board. Each type of board is divided into one or more of three classifications which reflect the three major material blends. (a) Cellulose fibre shoe board—Shoe board made principally from cellulose fibres containing no additives (other than sizing agents and colouring) in such quantities as to alter the basic solid fibre characteristics of the material. (b) Speciality shoe board—Shoe board made from cellulose fibre, leather fibre, or a combination thereof, with chemical additives that modify the physical properties of such fibres. (c) Leather fibre shoe board—Shoe board made from leather, with or without cellulose fibre, and containing no additives (other than colouring and sizing) in such quantities as to alter the basic fibre characteristics of the material.

Shopping Bag: Heavy single ply bag, constructed with top handle to facilitate carrying. This bag is typically distributed or sold at department stores and similar retail establishments to enable customers to carry out their purchases.

Shopping-Bag Paper: Kraft paper, bleached or natural in heavy basis weights, used for the manufacture of shopping bags.

Shops: Rooms or areas in a pulp and paper mill where repairs are carried out, such as machine, pipe, electrical, and instrument shops.

Short Sheets: Paper under the size ordered. They sometimes are inadvertently included in a ream with fullsized sheets.

Short Stock: (a) Beaten or refined pulp in which the length of the individual fibres has been greatly reduced by the mechanical treatment. (b) Pulp from naturally short-fibred sources such as hardwood.

Show Through: A condition where the printing on one side of the sheet can be seen from the other side when the latter is viewed by reflected light.

Shower Whipper: A type of conditioner used on cylinder machine pickups or top felts. It consists of a high pressure shower located within the felt loop and a whipper equipped with bats that beat the felt approximately four times per foot immediately after the showers.

Showers: Waterjets or sprays used throughout pulp and paper mills to wash wire mesh screens, wires, wet felts, and pulp pads on paper machines, cylindrical-type washers, pulp screens, pulp drainers, etc.

Shredder: A machine used in the mechanical treatment of waste-paper to open the pages of magazines, books, pamphlets, etc, and to reduce the sheets to smaller pieces, making them suitable for further treatment.

Shrinkage: (a) The change in the width of the paper sheet as it passes from the wet end of the paper machine to the reel. The magnitude of shrinkage will vary depending upon the weight of the paper, the degree of refining, and the type of fibrous raw material used, as well as the tension of the wet drawn. (b) Any decrease in the dimensions of paper. (c) The loss in weight incurred between the dry solids content of the paper machine furnish and the paper of paperboard produced.

Shunt: A resistor connected in a circuit to be measured and parallel with the current circuit of the measuring instrument.

Side Hill Deckers: An inclined stationary wire screen device used to thicken pulp stocks or slurries to medium consistency.

Side Relief: See 'Blow Down'.

Side-Run: A reel, generally narrow, but wide enough to permit its use for purposes other than re-pulping, deliberately produced in addition to the main order to ensure that the machine fill is as close as possible to the maximum trimmed machine width.

Sides: Right and wrong sides of the sheet. The term may also refer to the top and undersides or the felt and wire sides.

Sienna: A natural form of ferric hydrate used to make a lightfast paper dye that is resistant to acids, alkalies and chlorine.

Sieve Analysis: The determination of the proportion of different-sized aggregates in chips by means of sieves, *see also* Sieve Test.

Sieve Test: An analysis made on chips to determine the size proportions by running a representative sample through different size screens.

Sight Glass: A direct visual indicator of liquid level consisting of a transparent glass or plastic tube attached to vessels in such a way that the liquid height on the tube is equal to the level of liquid in the vessel.

Sign Board: A paper board upon which signs or advertising matter is printed. It is made of chemical pulp and reclaimed paper stock. It may be a white patent-coated or clay-coated board. It is a rigid board not susceptible to warping and has a surface adapted to receive fine printing. It is frequently treated to render it water resistant.

Sign Paper: A paper used for outdoor and indoor sign and poster work, especially for advertising purposes. It is generally made of bleached chemical pulp and is surface sized or treated to enhance the properties required for its use. Significant properties include rigidity, colour, finish, formation fastness-to-light, water resistance and fair strength.

Silicated Paper: A type of paper whose surface has been hardened and finished by coating it with a sodium silicate mixture.

Silk Protection Paper: (a) A writing paper having silk threads incorporated to give protection against duplication of counter-felting. (b) A sulphite or sulphate paper used as an inner wrapper for bolts of silk.

Silk Wrapper: A paper made of sulphite, sulphate or mixed furnishes on a multiple cylinder or combination cylinder-fourdrinier machine. It is duplex in colour, the most common combinations being buff and white, blue and white, and green and white. It is sufficiently strong to wrap and protect heavy silk bolts and resists the passage of moisture.

Silo: (a) A tall, narrow storage tank for solid materials, such as chips clay, and other papermaking substances, which are fed into the top and withdrawn from the bottom. (b) A holding tank in the white water system of the wet end of a paper machine, located under the breast roll end of the wire, which receives the white water as it drains through the wire, away from the forming paper web.

Silver Lable Paper: A lable paper which has been aluminium coated. It is used for box and gift wrap purposes as well as general label work.

Silver Tissue: A paper used for wrapping metal objects that are subject to tarnishing. It is a chemical

pulp and/or cotton fibre paper. It is free from chemical impurities which would cause tarnishing. It is generally made on a fourdrinier machine.

Silver Tissue Paper: Lightweight paper treated with copper salts or other inhibitors so that it will not tarnish silver items. It is used as a wrapping or packaging material.

Simili: A high grade, hard-sized wood-free printing of japanese origin having smooth finish and peculiar look-through.

Simplex Cutter: *See* Cutter.

Simulated Felt Mark: A pattern or texture produced in certain grades of paper such as cover, text, offset, papeterie, etc, by patterned rubber or composition rolls usually located in the press section of the paper machine. Such rolls are generally used on fairly high speed machines where the use of marking felts would not be feasible.

Single-Lined Board: Paperboard vat lined on one side with a stock different from the remainder of the board. Single manila-lined chip and single manila lined newsboard are examples in the folding grades. Single news vat-linen chipboard and single white vat-lined chipboard are examples of setup box grades.

Single Log Barker: A type of pulpwood bark removal equipment that removes the outer bark from logs, one at a time.

Single Motor Paper Machine Drive: The use of one big adjustable or fixed speed electric motor to run the various sections of a paper machine through a shaft or rope-type drive.

Single-Sheet Cot: The process of cutting a web or paper one sheet at a time.

Single Sheet Thickness: The distance between one surface of a paper or board and the other when determined by the standard method of test when a static load is applied.

Single Stage Centrifugal Pulp: A type of pump used in pulp and paper mills in which the total head is developed by one impeller.

Single Thick Cover: A cover paper of a single thickness of paper, not pasted.

Single White Vat Lined Chipboard: A paper board used for cartons, etc. It is made on a cylinder machine. The top liner is made of virgin pulp or waste paper stock or a combination of both (usually a news-print colour) the back is made of waste paper. The liner is usually fairly well sized and has a smooth finish.

Sisal: A plant (*Agave sisalena*), and the fibre obtained from its leaves and used for hard fibre cordage. Native to Central America, it is grown extensively in tropical countries. Some is used in strong papers and is obtained from cordage waste. The fibre has also been called sisal hemp.

Size: Any material used in the internal sizing or surface sizing of paper and paperboard. Typical sizes are rosin, glue, gelatin, starch, modified celluloses, synthetic resins, latices and waxes.

Size (of a Sheet): Dimensions of sheet of paper or board expressed in the following order: Width, Length, the width being the smaller dimension.

Size Recipitants: Chemicals, such as alum, copper, sulphate, and other copper salts, added to papermaking stock furnishes to precipitate rosin size out of solution and onto the fibres to impart water-resistant properties to the paper.

Size Press: An equipment consisting of an arrangement of rollers and devices for applying sizing materials on one or both surfaces of a web usually located between two drier sections. Size press consists of two rolls in horizontal or vertical or inclined positions.

Size Specks: Specks appearing in the sheet as transparent or glazed spots normally of different colour from the rest of the sheet, caused by undispersed particles or agglomerations of sizing materials carrying through into the sheet.

Sized and Supercalendered: A term denoting a supercalendered book paper with ordinary sizing. Also called S.S.C.

Sized Paper: Paper which has undergone sizing (*see* 'Sizing').

Sizing: (a) The addition of chemicals to impart certain surface characteristics of paper. Internal sizing is a measure of the resistance to the penetration of water and various liquids. Surface sizing relates to the increase of such properties as water resistance, abrasion resistance, abrasiveness, creasability, finish, smoothness, surface bonding strength, and printability, and the decrease of porosity and surface fuzz. (b) The addition of materials to a papermaking furnish or the application of materials to the surface of paper and board to provide resistance to liquid penetration and in the case of surface sizing, to affect one or more of the properties listed in (a).

Slaking: Flow-streaking of the stock on the fourdrinier wire, whereby small irregularities at the slice discharge grow into streaks that migrate across the wire, diagonally to the machine direction.

Sketching Paper: A paper used for rough drawings and plane. Almost any type of writing or low-grade drawing paper is suitable, but it should have a surface suitable for pencil marks.

Skid: (a) A paper-moving and shipping platform fitted with runners of appropriate height and separation width to enable the use of rocklift trucks to move them. (b) The operation of dragging tree lengths of logs from the cutting site to a collecting point.

Skidder: A special type of tractor used to drag pulpwood logs from the cutting area to the loading area.

Skin Coat: A very thin coating on a sheet of paper or paper-board.

Slack Edges: (a) One or both edges of a roll that are soft or slack, usually with thin paper at the edges. (b) In the process of coating paper, a condition in which the middle of the web carries the tension, the edges being slack.

Slack Roll: A reel of paper that has been wound with insufficient tension, resulting in a loose roll.

Slack Sized: Lightly sized and somewhat water absorbent. Also having a degree of water resistance below standard.

Slag Tank: A water-filled sump beneath a coal burning power furnace. It is used to sluice ashes from the wet bottom or receive the melted ash with low fusion temperatures.

Slaking: Generally the mixing of water with lime (CaO) to form calcium hydroxide [Ca(OH)₂]. Specifically, in the paper industry it is the reaction in the chemical recovery cycle of an alkaline pulp mill.

Slaking/Causticizing: A two-stage chemical process in the causticizing plant of an alkaline pulp mill in which the sodium carbonate (Na₂CO₃) in the green liquor is converted to sodium hydroxide (NaOH) to produce white liquor. The first stage is slakings, which consists of the addition of lime (CaO) to green liquor where it reacts with water to form calcium hydroxide [Ca(OH)₂]. The second stage is causticizing, in which the calcium hydroxide reacts with the sodium carbonate to form sodium hydroxide. Both stages overlap.

Slanderness Ratio: The ratio obtained by dividing length of fibre in mm by diameter/width of fibre compressed in microns. This ratio indicates the flexibility of fibre and its beating character.

Slat Drying: The drying of paper by the use of air in some paper mills. It is done by suspending the sheets over moving wooden stoves, supported by and carried on metallic frames with radiating arms. Also called spar drying.

Slaters Papers: A tarred or asphalt felt or sized sheathing used under slates in the roofs of building.

Slice: In a fourdrinier paper machine, a long, flat outlet located on the bottom side of the headbox from which the stock furnish is fed to the wire. It expands across the entire width of the wire and can be adjusted to regulate the flow of stock onto the wire, and thereby control the thickness of the sheet of paper produced.

Slice Marks: Uneven surface and look-through, resulting from maladjustment of the slice.

Slick Finish: A smooth finish.

Slime: An aggregation of heterogeneous material, sometimes having a slippery feeling, found at various points within a pulp or paper-making system. It may be caused by microbial growths or deposits of nonbiological materials.

Slime Hole: A hole in a paper web caused by slime which was incorporated inadvertently during the formation of the web, breaking out of the dried web when it is run through the calender stack. A slime hole is often identified by the occurrence of translucent fragments around the edge of the hole.

Slime Spots: Spots or smears in paper caused by fungi or bacterial growths in the pulp stock.

Slime Toxicants: Chemical poisons added to stock slurries to prevent the bacterial growth that produces slime. *See* slimicide.

Slimicide: Toxic chemical substance added to the pulp and paper process to inhibit the growth of undesirable microorganisms that causes slime.

Slip: A fluid or semisolid mixture of a pigment, such as clay, and water.

Slip Sheet Board: A paperboard which is used in connection with a mimeograph to prevent set off of the memographed sheets, especially when a bond paper is used.

Slip Sheet Paper: A paper used by a printer to protect a wet printed surface from setoff by the next printed sheet that is piled up on it, or in the case of rolls, which is wound on it. It must have a high finish and be free from lint.

Slipped Roll: A roll of paper which has slipped off its core or has been pushed out, giving the roll a cone shape or 'Pencil Point'.

Slitter: A paper web cutting assembly located on the winder or rewinder of a paper machine. It consists of suitably arranged mating pairs or a single set of rotating circular knives riding on a drum between which the paper is threaded and cut to make up large rolls into shorter rolls of specified widths.

Slitter Dust: Small particles of fibres or coating or both which are chipped off during the slitting operation which may adhere to the edge of the sheet and later work their way into subsequent converting operations. This dust is very similar to cutter dust.

Slitter Edge: That edge of the paper web which is made by the slitter.

Slitting: Converting rolls of paper as they are produced on a paper machine into shorter rolls of specified widths. It is done by cutting the web in the machine direction using circular, flat-faced, rotary knives during the winding operation on a paper machine, or as an off-machine finishing room operation.

Slitting Paper: A term applied to paper in jumbo rolls which is to be cut into narrower rolls.

Sliver: A small splinter of chipping material like wood, bamboo or reeds found in mechanical and chemical pulps as a result of incomplete cooking or fibre separation during the pulping process, or both. Slivers contribute to 'Dirt Count' in evaluating pulp cleanliness.

Slot Paper: A dense paper with a high, glossy finish made from cotton pulp. It is used in making formed electrical insulation.

Slotted Container: The type of paperboard box most generally in use as the outer container in the shipment of a wide variety of articles. It is made from a single sheet of corrugated or solid fibreboard, slotted and scored. The two side edges are taped or stitched together leaving the end flaps to be folded inward when the box is to be closed.

Slow Stock: A pulp suspension from which the water drains slowly. It usually results from refining. Also called 'Wet Stock'.

Slowness: The ability of a pulp and water mixture to retain water on drainage. The opposite condition is called freeness or wetness and refers to the ease with which the mixture or slurry will drain water.

Sludge: Solid material filtered out of mill waste water which is either disposed off in landfill operations or burned in power boilers.

Slurry: A suspension, usually aqueous, of pigment or other insoluble materials used in coating or paper-making.

Slush: A suspension of paper pulp of such consistency that it will flow or can be pumped.

Slushed Pulp: Pulp suspension in water which is transported from the pulp mill to the paper mill by pumping through pipelines.

Smashed Bulk: The bulk of a given number of sheets of paper under such a pressure as will eliminate the air between the sheets. This bulk is usually specified by book publishers.

Smelt: The molten chemicals that collect at the bottom of the sulphate recovery furnace (hearth). They consist primarily of sodium sulphide (Na_2S) and sodium carbonate (Na_2CO_3).

Smelt Dissolving Tank: A metal vessel located under a sulphate recovery furnace into which the molten chemicals flow. There they are quenched and dissolved in water or weak green liquor from the causticizing area to form fresh strong green liquor in the chemical recovery cycle.

Smelt Spout: A water-cooled jacketed trough through which the molten smelt is drained from a sulphate black liquor recovery furnace into a dissolving tank.

Smoke Stack: A vertical pipe, flue or chimney designed to exhaust gases and suspended particulate matter into the atmosphere from a power and recovery furnace in a pulp mill.

Smoothing Press: A type of press sometimes used in the press section under Fourdrinier machine of paper machine usually located next to the drier section. This press is equipped with smooth, low-porosity hard surfaced rolls having no felt running through the nip. This press is used to increase the smoothness and density of the paper web before drying. On some paper machines the smoothing press is located partway through the dryer section.

Smoothness: The property of a surface determined by the degree to which it is free of irregularities. In printing, the smoothness of the paper in the printing nip is important and is referred to as printing smoothness improves as the paper is compressed and locally deformed under mechanical pressure.

Smoothness Tester: A common paper mill laboratory instrument used to determine the degree of evenness or roughness of a paper and board surface. Instruments like Gurley, Bendtsen and Sheffield type, have been developed to continuously make this measurement on the paper machine.

Smoothened Watermarks: Watermarks which are so close together as to cover the entire surface of the sheet.

Snailing: Streaks or marks resulting from air bubbles or an excess of water in front of the dandy roll, or from bubbles at the slice.

Snap: The ability of paper and paperboard to immediately return to their original shape when bent and released.

Soaking Zone (SZ): The upper part of a continuous-type vertical digester where the chips are soaked in cooking liquor.

Soap Stone: See 'Talc'.

Soap Wrapper: Paper used as in inner or outer wrapper for cakes of soap. Depending on use requirements, it may be made from a wide variety of furnishes and may be printed, creped, waxed, laminated or otherwise treated. Important characteristics, include freedom from discoloration on contact with mild alkali as present in soap cakes and resistance to growth of bacteria and fungi.

Socket Paper: A strong, heat-resisting paper having a high dielectric strength and used in the manufacture of electric light sockets.

Soda Ash: A commercial anhydrous sodium carbonate (see Sodium Carbonate). They are generally two varieties of commercial soda ash for example light and heavy, depending on the particle size made during its manufacture.

Soda Chlorine Process: A multistage chemical process named CELDECOR process for pulping straw which includes an alkaline pretreatment, a chlorination step, an alkaline wash, and a final hypochlorite bleach.

Soda Pulp: A chemical pulp produced by the high temperature digestion of raw material with sodium hydroxide or caustic soda solution alone.

Sodium Aluminate ($\text{Na}_2\text{Al}_2\text{O}_4$): (a) A chemical used in a paper mill in conjunction with alum to control pH of stock to the paper machine for more efficient sizing and for better filler and fibre retention. (b) A chemical used as a sizing material in papermaking to provide water and ink penetration resistance in the sheet.

Sodium Bisulphite: Also called sodium acid sulphite (NaHSO_3). An inorganic salt which is acidic in solution and commonly used in pulping liquors and as an antichlor to remove excess chlorine from bleached pulps.

Sodium Carbonate: Commonly known as soda ash, sodium carbonate (Na_2CO_3) is an inorganic salt which is strongly alkaline in water solution. It is used for detergent and cleaning formulations and for the preparation of soda base sulphite cooking liquor. It is also an intermediate in the preparation of caustic liquor in the soda pulping process.

Sodium Chlorate: A powerful oxidizing agent (NaClO_3) which is reacted with sulphuric acid to produce chlorine dioxide for pulping bleaching.

Sodium Chloride: Common salt (NaCl). It is used in paper making to control the electrical properties of xerographic papers and for the mordanting of dyes and also in the manufacture of chlorine and caustic soda. It is obtained either from sea water or saline lakes sometimes known as sea salt or from rocks and salt deposits when it is called rock salt depending on the source the impurities differ in the end product.

Sodium Chlorite: The sodium salt of chlorous acid. Sodium chlorite is an oxidizing agent which is used for bleaching and for the delignification of wood pulp and the like. Chlorine dioxide is liberated when acid is added to an aqueous solution of sodium chlorite.

Sodium Hydrosulphite: A reducing compound ($\text{Na}_2\text{S}_2\text{O}_4$) which is used for bleaching (especially mechanical pulp). It is also termed sodium dithionite.

Sodium Hydroxide: Also known as caustic soda or soda lye, Sodium hydroxide (NaOH) is a powerful alkali most commonly used as the pulping agent in the soda process and as one of two pulping compounds in the kraft process. It is also used to treat cellulose in making viscose rayon and cellophane.

Shell: A sheet of corrugated or solid fireboard scored and folded to form a joined or unjoined tube open at both ends.

Sodium Hypochlorite: An inorganic salt (NaOCl) which is commonly used as a disinfecting and bleaching agent.

Sodium Losses: The total sodium expressed in the equivalent of Na_2O lost during the alkaline pulping process. It is usually calculated as a percentage of the white liquor to the digester or the actual loss per ton of air dry pulp produced.

Sodium Makeup: All of the sodium chemicals, such as sodium sulphate, caustic soda, sodium carbonate, etc, that has to be added to the alkaline pulping process to maintain the desired chemical balance, usually expressed in kg of equivalent Na_2O per tonne of air dry pulp produced.

Sodium Peroxide: An oxidizing agent, Na_2O_2 used in bleaching mechanical pulp, and in multistage bleaching of chemical pulps. It is hazardous substance and ignites on contact with water.

Sodium Recovery: The difference between all of the sodium lost during an alkaline pulping and recovery process and the original total sodium, expressed as a percentage of the total.

Sodium Recovery Index: A sulphate pulp mill chemical recovery performance value determined by dividing the sodium in the smelt in the recovery furnace by the total sodium entering the unit. It can be expressed as a percentage.

Sodium Silicate: Any chemical compound of soda (Na_2O) and silica (SiO_2) in varying proportions. Commonly called 'Water Glass' it is marketed as a solid or in aqueous solution. It is used as an adhesive for paperboard and imparting stiffness in paper and board.

Sodium Sulphate: See 'Salt Cake'.

Sodium Sulphide: An inorganic salt (Na_2S) which is commonly used as a pulping agent in the kraft process.

Sodium Thiosulphate: An inorganic salt ($\text{Na}_2\text{S}_2\text{O}_3$) which is used to neutralise excess chlorine in pulp bleaching. In this paper-making application it is also referred to as 'Antichlor' or 'Hype'.

Soft: A term applied to paper which has a soft surface and body and little or no sizing, requiring relatively little pressure for printing. News and common book paper are examples.

Soft Pulp: Pulp made by cooking chips under severe conditions that remove more than the usual amount of lignins and other noncellulosic material. Soft pulp is referred to as having low 'K' or Kappa numbers or as easy bleaching pulp.

Soft Roll: A roll which is soft because of loose winding and/or caliper variations across its face.

Soft-Sized: A relative term indicating a low degree of resistance to spontaneous penetration or surface spreading of water or aqueous ink in contrast to hard sized.

Softners: (a) Substance added to paper stock furnish that will promote softness in the final sheet. (b) Chemicals added to hard water to convert it to soft water to make it more suitable for use by the mill.

Softening Point: The temperature required to soften papermaking rosin to a specified viscosity.

Softness: The property of a paper, usually tissue or towelling, that relates to the pleasing, soothing sensation perceived by tactility or handling. Subjectively, softness combines psychological and physical attributes, including limpness, smoothness, thickness, compressibility and possibly others, in a combination not yet accurately defined. Correlation of test methods with subjective perception has not been very well established.

Setting Time: The period elapsing between application of the adhesive and the moment when the joint is sufficiently firm to handle temporarily.

Software: The collection of programme and routines associated with computers used to control various pulp and papermaking processes.

Softwood: Wood coniferous trees whose leaves are needlelike such as pine, spruce or hemlock or scale-like such as cedar.

Softwood Pulp: A pulp made from softwood or coniferous wood species.

Solid Board: A board made of the same material throughout as contrasted with a combination board where two or more stocks are used. A pasted board is not a solid even though the same stock is used.

Solid-Fibreboard: Pasted or laminated board of heavy substance usually highly compressed with a kraft facing on one or both sides suitable for making large containers.

Solid Fraction: The fibre, filler, sizing material, etc, that constitute what is generally thought of as paper. It is that ratio of the volume of solid material to the total volume of the measured sample or paper.

Solid Waste Management: The purposeful, systematic control of the generation storage, collection, transport, separation, processing, recycling recovery and disposal of solid wastes.

Solid Wastes: Any solid material produced during the manufacturing process in a pulp and paper mill, such as sawdust and sludges, which must be disposed of by transporting it off the site, recovered, recycled into the process, or utilized to produce energy by incineration.

Solvent Sizing: Sizing by use of rosin in a solvent, the solution being applied to the unsized paper and the solvent being removed by evaporation and recovered.

Soot: Chemical dust and other suspended materials that will deposit on tubes in the super-heater, boiler and economizer banks of power and recovery

furnaces. The soot must be periodically removed for proper operation of the machinery.

Soot Blower: A manually or automatically operated probe-type device used to blow dust, soot, and ash from the fireside of boilers tubes in a furnace by employing steam or compressed air.

Sorting: (a) The operation of inspecting sheets or papers, either by hand or by machine, to remove those that are not saleable as perfect paper. (b) The classification of rags or waste paper into groups according to quality for use in the manufacture of paper or board.

Sounding the Reel: The method used by paper machine back-tenders in evaluating the operation of the paper machine by slapping the reel of paper with their hand or a billy stick to obtain an indication of its hardness by the sound produced.

Sour: To clean a fourdrinier wire, dandy roll, etc, with an acid solution.

Sour Coated Paper: Coated paper which has an offensive odour resulting from the use of decomposed casein in the coating mixture.

Source Separation: The segregation and collection of individual recyclable components at the point of generation before they become mixed into the solid waste stream (for example bottles, cans, newspapers, corrugated containers, or office papers).

Soya Flour: The flour or meal resulting from grinding soyabeans and extracting the oil. It consists of about 45 percent soyabean protein the remainder being hemicellulosic in nature.

Soyabean Protein: Usually the alpha-protein fraction of the soyabean which is used as an adhesive and as a sizing and coating material for paper.

Spar Drying: See 'Slat Drying'.

Spare Parts: Extra, critical-type pulp and papermaking equipment components which are most likely to break down or wear. They are put into storage to be used as emergency replacements when required so that the undesirable downtime of the equipment is minimized.

Special Food Board: A variety of paperboard grades used for packaging foods. In this group are fourdrinier grades of bleached chemical pulps and cylinder grades of solid bleached pulps, single and double-white-lined manilas. The boards are hard sized for water resistance and are frequently coated for certain applications and for high quality printing. After printing, the cartons are frequently waxed, coated, or otherwise treated. Typical examples are butter, ice cream, and milk cartons.

Special Marking Order: An order made to customer specifications are opposed to stock order.

Specialities: (a) Grades of paper and/or paper board made with specific characteristics and properties to adapt them to particular uses. (b) Grades of papers and/or paperboard made in a given mill which are not the primary products of the mill.

Specific Gravity: The ratio of the mass of the specimen to the mass of an equal volume of water. The term is rarely used for paper or paper board. Sometimes being used when the term density is more appropriate. Specific gravity of pulpwood is measured by standard method.

Specific Heat: The relationship of the amount of energy required to raise the temperature of a unit mass of material through 1°C as compared with raising an equivalent quantity or reference material, such as water or air.

Specific Inductive Capacity: The ratio of the capacitance of a two plate electrical condenser when the space between the plates is filled with the test sample to the capacitance of the same condenser when the space between the plates is filled with air (or more strictly, when the space is evacuated). It is frequently called the dielectric constant. This property is of importance in condenser paper and is electrical insulating paper.

Specimen: A representative sheet taken during sampling.

Speck: A particle of contrasting appearance in pulp or paper.

Specular Gloss: The ratio of the intensity of light reflected from the specimen to that similarly reflected from an arbitrary standard, for specified and equal angles of incidence and reflection. It is an important measure of gloss, glare, and glossiness of paper; it is usually evaluated for incident and reflected rays of light making a small angle with the surface of the paper.

Spent Liquor (SL): Used cooking liquor in a chemical pulp mill which is separated from the pulp after the cooking process. It contains the lignins, resins, carbohydrates, and other extracted substances from the material being cooking. Usually, this liquor is processed through a recovery cycle to produce fresh cooking liquor and steam for process use and/or power generation.

Spherical Boiler: Also known as Spherical Digester or Kier. A round, globe-shaped, batch-type digester that is used in pulping rags, straw, etc. It is rotated during cooking process, to enable uniform mixing of chemical with cooking stuff.

Spinning Paper: Paper having a particularly high tensile strength in the machine direction, suitable for spinning into twine or cord.

Spiral Laid: A term applied to a special type of dandy roll, where the laid wires run around the circum-

ferences of the roll producing lines parallel with the grain of the paper. This laid mark is characterised by the absence of chain lines.

Splice: The joining of the ends of two webs of paper to make a continuous roll. Materials used are a variety of adhesives, gummed tapes, or splicing tissues.

Splice Tag: A marker used in roll paper to indicate the location of a splice.

Splicing: The operation of making a splice (*See Splice*).

Splicing Tissue: Usually a thin (25 to 75 μm) tape composed of a material such as paper, cloth or plastic film coated with an appropriate adhesive. It is used for splicing paper webs. The adhesive may be pressure sensitive, water or solvent soluble, thermoplastic, or thermosetting.

Split Coloured Paper: A paper one side of which is uncoloured and the other coloured.

Splitting: The separating of plies of paper or paperboard.

Spongy: A term used to describe (a) paper that is bulky and compressible or (b) Paper that is unsized so that it is absorbent.

Spray Coating: A process in which the coating is applied by batteries of paint guns, arranged to spray one coat on top of another in rapid succession until a sufficient weight of coating has been built up.

Spray Dyeing: (a) A process of spraying a dyestuff solution onto a sheet of paper by means of a spray nozzle, either before or after the web passes over the first suction box. (b) A process of spattering a dyestuff solution onto the paper web by means of rotating brushes.

Sprayer: Devices used throughout a pulp and paper mill to convert liquids into small droplets or mists.

Spreader Stoker: A type of solid fuel burning system in which a travelling grate is fed by a distributor which throws the fuel through flames onto the top of the fire, with the ash removed continuously by a low, forward movement opposite to the stream of fuel and into receiving pit.

Spring Roll: A paper-web carrying roll mounted on spring suspension bearings, and located in a position in the papermaking or converting operation to cushion sudden deviation in the web tension. Thus, it facilitates control of the web through the process and prevents breaks.

Spring Wood: The wood of a tree produced early in the growing season of each year. It is characterised by wider thinner walled cells than produced later in the growing season, which is called summerwood or latewood. This early growth is also called earlywood.

Springback: (a) The increase in thickness (after a certain interval of time) of a pulp mat after it has been

subjected to a definite pressure for a specified time. It is a special meaning of the more general term 'resiliency'. (b) The degree to which a sheet can return towards its original flat condition after being folded under specified conditions and then released.

Square Sheet: A term used to describe a paper or paperboard, which has equal tensile strength and tearing resistance in machine and cross-machine directions.

Squared: (a) Cut or trimmed on two or more sides to ensure exactness of angle. (b) Sectional or scale paper.

Squared Paper: (a) Drawing or tracing paper having ruled or printed squares of various sizes. (b) A paper which has been guillotine-trimmed square on four sides or on one side and one end.

Squaring: Operation in which sheets of paper or board are produced to the desired sheet size with clean edges and four 90° angles.

Squeeze Rolls: Types or small cylindrical rolls used on multi-cylinder paper board machines to press the layers of webs together to form a multi-ply sheet.

Squirrel Cage Induction Motor: A type of motor used in mills in which the secondary circuit consists of conductors suitably disposed in slots in the secondary core and connected at both ends of the core.

Squirt Trim: A fine, high-pressure water jet located on each edge of the paper machine wire. It is used to trim the web to the desired width.

Stability: The ability of paper or paperboard to resist change in any of its properties on exposure to various conditions.

Stabilized: A paper whose moisture content is in equilibrium with the moisture of the surrounding air.

Stack: (a) Calenders used on paper machines. (b) A pile of paper sheets or pulpwood logs, or the act of putting paper sheets or pulpwood logs into a pile. (b) A vertical pipe or flue designed to exhaust gases and suspended particulate matter into the atmosphere from power and recovery furnaces and lime kilns in a pulp mill.

Stack Effect: The movement of hot gaseous mixtures up a pulp mill power and recovery boiler or lime kiln flue due to the temperature difference between the mixture and the atmosphere.

Stack Sampling: The process of obtaining representative samples of gaseous mixture in ducts and flues of power and recovery furnaces or lime kilns in a pulp and paper mill for the purpose of making analytical measurements on the gaseous mixtures.

Stained Paper: (a) A paper which has been surface stained with colour, as for example on the calender stack of the paper machine. (b) A semiabsorbent sheet of white or tinted paper run through a bath of colour and sizing material to produce unusual colours and/or

a depth of colour not normally obtained in the beater.
(c) An old term for a printed wallpaper.

Standard Brown Kraft Wrapping Paper: Uncoloured kraft wrapping paper made from unbleached sulphate pulp

Standard Cover Paper: A cover paper used for tablet covers, envelopes, mailing folders, menus, etc. It is made from unbleached chemical and mechanical wood pulp. It usually has an antique finish and is made in wide range of colours.

Starch: A white, odourless carbohydrate found in various plants. When extracted and purified, primarily from tapioca, corn, potatoes and wheat, it is used in paper as an adhesive or sizing agent.

Starred Roll: A roll of paper having a circumferential pattern on the end which resembles a star or floral design or a series of V's extending from the core to the outer circumference of a roll. It is usually caused by loose winding in the centre and harder winding on the outer edges, or occasionally by a bump.

Starting Burners: Auxiliary fuel burners located on a sulphate black liquor recovery furnace. They are used to ignite and sustain the ignition of the black liquor and are not normally used for continuous firing.

Startup: The initial operation of new process equipment especially pertaining to a new paper machine in a paper mill.

Statement Ledger: A special grade of ledger paper used for bank statements, loose-leaf ledger sheets for use in bookkeeping machines and similar purposes, where the writing is done entirely by typewriters and book keeping machines. Since it may be in and out of the machine many times, it requires good wearing quality. Its primary use requirement, in addition to the normal requirement of ledger paper, is stiffness in order that it may stand upright in posting file and feed to an automatic machine without bending or slipping out of position.

Static Electricity: The electrical charge which sometimes collects on paper and other electrical insulating materials owing to contact with other substances. It is occasionally troublesome wherever dry paper is handled, for example in the last drier section of the paper machine, in calender stacks and in printing. It is most evident at low relative humidities when natural dissipation of the charge or leakage to ground objects is slow. Electrostatic charging of paper not only causes trouble in handling of paper, because of the tendency of charged sheets to stick together, but it is hazard since a shock from a moving web or roll may cause a workman to move involuntarily into dangerous contact with nearby machinery.

Static Friction: The starting friction between the surface of papers used for the outer wall of shipping

sacks, when like surfaces are placed crosswise in contact.

Stationery: An inclusive term which, as related to paper products, includes papeteries, typewriter paper, packaged papers, billheads, and other papers sold by stationers.

Steam Chest: Part of a black liquor evaporator that contains steam-heated tubes with which the liquor comes in contact to boil off the water.

Steam Finish: A finish obtained by means of a steam spray striking the sheet before it enters the machine calenders or the supercalenders. The effect is to increase the density, smoothness, and gloss of the sheet.

Steam Joint: A special rotary fitting on paper machine dryer drums through which steam is admitted and condensate is removed.

Steam Shatter Nozzle: A duck-billed pipe jet installed above and in front of the discharge end of the smelt discharge spout on a sulphate chemical recovery furnace. It projects a steam jet on the issuing smelt as an additional aid to the breaking up of the smelt steam before it comes into contact with recirculated green liquor shatter sprays.

Steam Stripping: A method used by some sulphate pulp mill to purify contaminated condensates by removing the total reduced sulphides (TRS) and box biochemical oxygen demand (BOD) by a controlled direct steam injection process.

Steam Trap: A device used to automatically drain condensate from steam systems such as found on dryers and heat exchangers.

Steam Turbine: A source of prime movement consisting of a series of blades on which steam jets are allowed to impinge in such a way that the action rotates a shaft on which they are mounted and which is connected to an electric generator, pump, or other machinery to be driven.

Steamed Mechanical Pulp: An unbleached groundwood pulp produced by steaming the wood before grinding. It has a dark brown colour and is characteristically stronger than other groundwood.

Steel Engravers Paper: A paper for printing from a hand engraved intalic plate, usually a high grade cotton fibre content or chemical pulp bond used for letterheads, formal calling cards, wedding invitations etc.

Steel Interleaving Paper: A kraft paper used in steel mills to separate sheets of steel. It is essential that the paper be chemically neutral and free from shives or other materials which might mark steel surfaces.

Stem Fibres: Fibres from the main stem or trunk or the plant, such as wood fibres, straw, bamboo, bagasses.

Stencil: (a) Material perforated with lettering or a design, through which ink is forced onto a surface to be printed. (b) The assemblage of a stencil sheet, a cushion sheet and backing sheets, before the stencil sheet perforated with typewriter or hand held stylus.

Stencil Backing Sheet: A good grade of hard paper (essentially a tympan paper), used as backing for a stencil sheet. It is usually oiled.

Stencil Board: A paperboard used in making stencils for marking shipping cases and the like. It is made on cylinder or fourdrinier machine from long-fibred chemical pulps, but may contain hemp stock and is so formed that it will oil uniformly. It is ordinarily impregnated with linseed or other oil. The sheet is strong hard surfaced, and long wearing. It gives a clean cut on the stencil machine or stamp and must resist penetration of ink and fuzzing action when the ink brush is passed over the surface. A lighter grade of stencil board is used as a stencil for decorative work. Significant properties include high tearing resistance, high finish, and stiffness.

Stencil Cushion Sheet: An unimpregnated tissue paper of the same grade as stencil paper which is placed between the stencil sheet and the backing sheet during the cutting of the stencil to act as a cushion.

Stencil Tissue: The base of a stencil sheet to be used on Mimeograph and other types of duplicating machines. Important properties are high oil permeability combined with high tensile strength.

Stenographers' Notebook Paper: As the name implies, a writing paper designed for use in stenographers' notebooks. It is normally made from chemical pulp and is characterised by a smooth writing surface, water and ink resistance, opacity, cleanliness and bright colour.

Stenotype Paper: A low grade of bond paper supplied in the form of small rolls or folded packs for use on stenotype machines.

Stereotype Backing: A gummed feltsheet made in a range of thicknesses and cut into stripes of various widths, used to back out or pack the spaces in the molded stereotype dry mat supplied in the 0.60 to 0.90 mm thickness range. Its purpose is to prevent the spaces from being pushed back by the hot metal when a stereotype plate is being cast. Stereotype backing is not required with packless mats.

Stevens Former: A paper-forming device used to manufacture a wide variety of papers in weights ranging from tissues to heavy paperboard grades. It consists of a wire-covered suction roll, or a vacuum cylinder upon which the stock is formed, and a unique approach flow section which brings the stock to a restricted forming area under pressure. The forming area is located in the upper quadrant of the upturning side of the cylinder.

Stick Mark: Marks in coated paper caused by the rods or poles used in festoon drying.

Stiffness: The ability to resist deformation under stress. Resistance to a force causing the specimen to bend is termed bending or flexural stiffness.

Stippling: A type of embossing of paper to reduce the high gloss of a sheet by running the sheet between rollers with counter-grained surfaces.

Stock: (a) Pulp which has been beaten and refined, treated with sizing, colour, filler, etc, and which after dilution is ready to be formed into a sheet of paper. (b) Set pulp of any type at any stage in the manufacturing process. (c) Paper on inventory or in storage. (d) Paper or other material to be printed, especially the paper for a particular piece of work. (e) A paper suitable for the indicated use, such as coating raw stock, milk-carton stock, tag stock, towel stock, etc.

Stock Agitator: A type of equipment or method used to keep the fibres well-dispersed in a stock slurry storage vessel by the use of air or mechanical stirring action.

Stock Blending: The process of mixing a variety of types of pulps, additives, dyes, and chemicals to make up a stock slurry satisfactory to meet the specification of a particular grade of paper.

Stock Chest: Most often refers to a large, agitated tank in a paper mill which is used for receiving and holding the stock during the stock preparation phase of papermaking.

Stock Cutting: A stock preparation process of cutting papermaking fibres to the desired length by mechanical treatment in beaters and refiners.

Stock Entry: That portion of a conventional cylinder-type paper machine which takes the stock flow from the stock supply piping system and spreads it across the width of the machine, reducing the velocity and delivers it to the entry point.

Stock Order: An order to be filled directly from warehouse inventory of a standard grade, size, weight, and colour, as opposed to a special making order.

Stock Preparation: The area of a paper mill where pulp is received from an on-site or off-site pulp mill, prepared for storage in slurry form, mechanically treated in beaters and refiners, mixed with other pulps, additives, dyes, and chemicals and then cleaned before being sent to the paper machines. Also known as the beater room or Beater House.

Stock Proportioning: The process of mixing a variety of types of pulps additives, dyes, and chemicals to make up a stock slurry satisfactory to meet the specifications of a particular grade of paper *see also* 'Stock Blending'.

Stock Pump: A pump, which is sometimes specially designed for moving pulp slurries through pipelines.

Stock Size: Common sized of papers and boards which are usually stocked by producers, distributors, or consumers. They are sizes which are standard and which are reordered from time to time.

Stone Ground Wood (SGW): Pulp made by abrading wood logs against a reveiving stone, usually at atmospheric pressure but sometimes done under pressurized conditions.

Storage Chests: Storage vessels used throughout the mill to hold stock slurries and other liquids during the pulp and papermaking process.

Storage Tanks: Large, metallic, or wooden vessels used throughout the mill to hold raw and finished materials in the pulping and paper-making process.

Strain: The deformation per unit length resulting from the application of a force. In the case of the tensile testing of paper, it is customary to express the deformation at rupture as the percent stretch.

Straw: Wheat or Paddy. The stem portion of the wheat or paddy plant, which is a potential source of cellulosic fibres for paper making. For pulping purposes, generally the stem is cut about 8 cm and its top seed portion removed.

Straw Pulp: A papermaking pulp made from the straw of such plants as wheat, oats, rye, barley, paddy, etc.

Straw Board: A paper board made largely from straw for specially purposes; formarly used extensively for common items such as step boxes, egg case partitions, globe-type maps, and to some extent as a corrugating medium.

Street Ell: A pipeline elbow fitting having thread on the outside of one end (male) and threads on the inside of the other end (female).

Stress: The internal force per unit area of a paper sheet which resists external load, expressed in pascals, (Newtons per square meter).

Stretch: The elongation corresponding to the point of rupture in a tensile strength measurement. It is usually expressed as a percentage of the original length.

Stretcher Roll: Any adjustable roll in contact with the web of paper and other fibres on a paper machines. It can be moved up and down or back and forth in order to increase or decrease the tension of the sheet.

Strike-in: The penetration of liquid into a sheet of paper. The term is commonly used in printing where it refers to absorption of ink vehicle by the paper. Inks used in printing newspapers 'dry' by strike-in or absorption. In other cases strike-in may be objectionable as the absorbed vehicle increase show-through.

Strike-Through: A case of extreme strike-in in which the ink vehicle penetrates the sheet and is visible as a stain on the opposite side.

Strip Chart Paper: A form of recording instrument chart paper made in light weights and in narrow rolls for continuous recording of data by process control instruments. It is generally made of rag and/or chemical pulps, and must have uniform thickness and weight, good dimensional stability, and hard sizing. Translucency may be required where sections of the charts are to be reproduced where section of the charts are to be reproduced by blue printing or direct printing.

Strip Film Paper: A strong, well-formed chemical pulp sheet, with a high density, which is coated with a sensitized cellulose acetate film.

Stripe-Coated Carbon: Carbon paper in which areas are left uncoated or clean of carbon so that a clean edge is available for gluing sets or to leave out certain information from the carbon copies.

Strong Black Liquor Oxidation (SBLO): The transformation of unstable sodium sulphide (Na_2S) to the more stable sodium thiosulphate ($\text{Na}_2\text{S}_2\text{O}_3$) in sulphate black liquor with air or oxygen after evaporation to 55 percent or more solids concentration so that hydrogen sulphide (H_2S) and organic sulphur compound formation is minimized during combustion in a chemical recovery furnace of a pulp mill.

Structural Fibre Insulation Board: A board manufactured principally from wood, bamboo, bagasse, or other vegetable fibre by a felting or molding process to which is added a suitable sizing material to render it water resistant and a small amount of resin to improve fibre bonding. The board possesses structural, thermal-insulating, and sound-deadening qualities.

Stub Roll: An incomplete roll of paper of small diameter which (a) remains from the use of the greater portion of the roll, or (b) is made and used for testing purposes.

Stuck Web: Adherence or layers of a roll to each other whether caused by water, adhesive, or other tacky material.

Stuff: An aqueous suspension of one or more pulps and other materials from the stage of disintegration of the pulp to the formation of the sheet of paper or board.

Stuff Box: A compartment in a stock-metering box used on some paper machines to ration out enough furnish supply to the wet end and return the excess to the machine storage chest over a constant head baffle, to meet the required sheet weight being made.

Stuff Pump: Specially designed pumps used to move pulp slurries and stock furnishes through pipelines.

Stump Wood: The bell-shaped base portion of a tree just above the roots.

Substrate: The paper or other material onto which printed matter is impressed.

Substance: Weight of a given specimen of paper in g/m^2 under standard atmospheric conditions. It is also called 'Basis weight' or 'grammage'.

Suction Apron: A suction plenum box with a top perforated with holes and located between the tapes of a cutter in a board mill. It is used to keep the sheets from leaving the cutter as they proceed to the collection boxes for proper alignment and bundling.

Suction-Blanket Mark: An undesirable mark produced by the endless perforated blanket which runs over the suction box on a conversion coating machine.

Suction Box: A device used to remove water from the sheet being formed on the fourdrinier wire of the paper machine or from the wet felt of a cylinder machine prior to pressing. It is a box with a perforated top over which the wire or perforated top over which the wire or felt passes. Water is removed from the stock or web by induced suction within the box.

Suction-Box Marks: Streaks in paper produced by uneven suction.

Suction Couch Roll: A type of paper machine couch roll which is essentially a rotary suction box used to remove water from the wet web after it is formed on the wire, and to pick up the web so that it can be transferred to the wet press section.

Suction Deckle Edge: Sides of a paper sheet which are produced by removing the stock from the edge of the paper machine wire by the use of a vacuum.

Suction Dusting: A method of eliminating dust from the ends of a roll or the sides of a pile of paper by means of vacuum cleaner.

Suction Feed: A suction gripper that feeds sheets or blanks of paper or board into a printing press or converting or processing equipment.

Suction Hinge: A thin section in a sheet of paper, which serves as a hinge produced by removing a part of the stock from the fourdrinier wire by means of suction nozzles.

Suction Press: A wet end press roll that has vacuum applied to it. It aids in the removal of water from the wet paper web.

Suction Press Roll: A rubber-covered perforated roll usually with a bronze or stainless steel shell equipped with an inside suction box. It is used as one of a pair of rolls, the second being a solid roll. The wet paper is carried through the nip of these rolls on an endless wet felt, which further reduces the water content.

Suction Pump: A pump that is connected to the suction boxes and couch roll on the wet end of a paper machine to create a vacuum which removes the water from the wet web forming on the wire.

Suction-Roll Mark: Mark in papers, sometimes in a pattern, produced by excessive suction in the suction

couch roll under the fourdrinier wire or suction press roll.

Sulphonated Chemimechanical Pulp (SCMP): Pulp made by sulphonating chips prior to subjecting them to two stages of atmospheric refining for final mechanical separation of the fibres.

Sugar-Bag Paper: Paper made from bleached, semi-bleached, or unbleached sulphate pulp for manufacture into bags for sugar.

Sugar-Wrap Paper: A bleached chemical pulp sheet manufactured for wrapping lump sugar. The paper should lie flat and be suitable for die cutting.

Sulphidity: Sodium Sulphite (Na_2S) content in a sulphate chemical recovery furnace smelt. It is expressed as percent Na_2O and calculated by the equation:

$$\frac{\text{Na}_2\text{S}}{\text{Na}_2\text{S} + \text{NaOH} + \text{Na}_2\text{CO}_3} \times 100, \text{ on active alkali basis,}$$

$$\text{and } \frac{\text{Na}_2\text{S}}{\text{NaOH} + \text{Na}_2\text{S} + \text{Na}_2\text{CO}_3 + 1/2\text{Na}_2\text{SO}_3} \times 100,$$

on total alkali basis.

Sulphamic Acid: An inorganic acid (NH_2HSO_3) used in flame retardant formulations and as an inhibitor in pulp bleaching.

Sulphate Pulp: Term refers to a strong papermaking fibre produced by the kraft process in which the principal cooking agent is a mixture of sodium sulphide and sodium hydroxide. It is used interchangeably with 'Kraft'.

Sulphite Pulp: A papermaking fibre produced by an acid chemical process in which the cooking liquor contains an excess of SO_2 . The sulphite liquor is a combination of a soluble base (such as ammonium calcium, sodium, or magnesium) and sulphurous acid. Calcium was commonly used in the past but is not as widely used now because of chemical recovery and pollution abatement problems.

Sulphur Impregnated Board: A board which has been impregnated with molten elemental sulphur to improve stiffness, performance in high humidity environments and impart acid resistance, high dielectric strength, and low heat conductivity.

Sulphuric Acid: Also called oil of vitriol, sulphuric acid (H_2SO_4) is a commercially important mineral acid with widespread industrial use. In the paper industry it is used to parchmetize paper to prepare chlorine dioxide bleach from sodium chlorite, to 'sour' Bronze paper machine wires, to dissolve certain wet strength resins, to assist in re-pulping wet strength broke, etc.

Summerwood: The part of an annual ring produced during the latter part of the growing season (in the summer); the outer portion of the annual ring. It is usually denser than springwood.

Super News: Newsprint having smooth finish, making it suitable for gravure printing.

Supercalender: A calender stack used to increase density, smoothness, and gloss of paper. It is constructed on the same general principle as calender, except that alternate chilled cast-iron and soft rolls are used in the super-calender. The soft rolls are constructed of highly compressed cotton or paper. It is not an integral part of the paper machine, where as the calender is.

Supercalendered Cover Paper: Uncoated cover paper that has a high or glazed surface, obtained by passage through a supercalender stock.

Supercalendered Finish: A finish obtained by passing paper between the rolls of a supercalender under pressure. Supercalenders used for uncoated paper are usually composed of alternate chilled cast-iron and paper rolls; for coated paper the rolls are usually chilled cast-iron and cotton. The resulting finish will vary depending upon the raw material used in the paper and the pressure exerted upon it, from that of the highest English finish to a highly glazed surface papers supercalendered to a very high gloss are sometimes referred to as 'plate finished'.

Supercalendered Paper: Paper that has been highly calendered in a super-calender in order to obtain a smoother surface and higher gloss than machine-finished paper (*see* 'Machine-finished paper').

Superglazed Finish: An unusually high glazed finish (*see* Cast Coated Paper).

Superheated Steam: Steam at a pressure lower than the vapour pressure of water corresponding to the temperature of the steam, or steam at a temperature higher than the temperature at which water exerts a power pressure equal to the steam pressure.

Superheater: A heat exchanger inside a furnace which receives dry, saturated steam from the drum and raises its temperature.

Supplement Paper: Paper used in newspaper supplements, comic or photogravure sections.

Surface Application: Any operation consisting of the application on an appropriate material to the surface of a paper or board to change certain of its characteristics.

Surface Coated: A term applied to any paper or paper-board which has one or both sides coated with a pigment or other suitable material.

Surface Colouring: The application of a colour to paper after the paper web has been formed on the paper machine. The dyeing may be a part of the papermaking operation on the paper machine or it may comprise a separate operation.

Surface Sized: An adjective describing paper or paperboard whose surface has been treated with a

sizing material applied to the dry or partially dried sheet either on the paper machine or as a separate operation.

Surface-Size Press: A unit of a paper machine, designed for relatively light applications of surface-sizing agents of other materials to paper or paperboard, usually located between two drier sections comprising a vertically, inclined or horizontally oriented set of two press rolls and equipment for spraying or otherwise applying the sizing material to one or both sides of the sheet and removing the excess therefrom (*see* Size Press).

Surface-Sizing: A process of applying sizing materials to the surface of the dry or partially dried sheet either on the paper machine or as a separate operation.

Surface Strength: Resistance of the surface layer of a sheet to the breakaway of surface fragments, when the sheet is separated from the inked plate or blanket in the printing process.

Surface Tension: A force existing at various solid, liquid, and gas interfaces which tends to bring the contained volume into a foam having the least superficial area.

Surfactant: A material which when used in small amounts modifies the surface properties of liquids or solids. Detergents, wetting agents emulsifying agents, dispersing agents, and foam inhibitors are all surfactants.

Surge Tank: A container or vessel attached to the process so that it will store gaseous, liquid, or solid materials to make up momentary increases in volume or pressure and permit an intermittent operation to function without upsetting the continuity.

Surgical Dressing Paper: A plasticized glassine sheet used to wrap surgical dressings and pressure-sensitive adhesive bandages. It must be able to withstand sterilization heat treatment without discoloration or embrittlement.

Suspended Solids: (a) Solid particles evenly distributed throughout a gaseous material, such as in power and recovery boiler flue exhaust or in fog. (b) Fibres and other colloidal solids held in uniform distribution throughout a mass by mechanical treatment in beaters or refiners. (c) The undissolved solid particles of organic and/or inorganic material in pulp and papermaking solutions, such as spent liquors, white water process liquids, and liquid wastes.

Sweat Drier: A paper machine drier cylinder that operates at a temperature sufficiently low to cause condensation of moisture or sweating on its surface. It serves to cool the sheet and slow the drying process. The sweat drier is usually located at the end of a drier section, and may be chrome coated or otherwise protected against corrosion.

Sweetener: Long fibre or virgin pulps added to white water to improve its filtering properties in save-alls.

Switch: A device usually used in an electrical circuit for making, breaking, or changing connections.

Synchronous Machine: A machine in which the speed of normal operation is exactly proportional to the frequency of the current used to drive it.

Synchronous Motor: A synchronous machine which converts electric power into mechanical power and has a speed strictly proportional to the frequency of the operating current, either single phase or polyphase.

Synergistic Effect: The cooperative action of separate substance producing a total effect greater than the sum of the effects of the substances acting independently. An example is when chlorine dioxide (ClO_2) solution is added to the chlorination stage of a pulp-bleaching process.

Synthetic Fibre: Filaments extruded or spun from man-made polymers.

Synthetic Paper: A general term for non-cellulosic sheet material resembling paper and used in a similar fashion. Most synthetic papers are made from thermoplastic materials such as polyolefins, nylon, polystyrene, etc, by direct film or foil extrusion methods or by bonding filaments thereof.

Synthetic Resin: A complex, substantially amorphous organic semi-solid or solid material prepared by chemical reaction or polymerization of comparatively simple compounds. The synthetic resins approximate natural resins in various physical properties. Types include formaldehyde condensation products of phenol, urea and melamine; reaction products of polyhydric alcohols and poly-basic acids (alkyd and polyester resins); polymerization products of acrylic acid and its derivatives (acrylic resins) or styrene polystyrene; polymers of butadiene and its derivatives or copolymers with other materials (synthetic elastomers), etc. These resins find use in the paper industry as adhesives in coating and laminating, as barrier materials, and as agents to impart special properties such as improved wet and dry strength.

Shelf Life: Same as 'Package Life'.

Skillet: A plain, glue-end carton, that is intended to be overwrapped.

Spiral Winding: A style of continuous angular winding to make a tube having the various plies partially overlapping one another.

Starch: Normally starch, like cellulose, possesses negative charge when dissolved in water. This is called as Anionic starch. When starch is converted by etherification with chemical treatment it develops cationic charge when dissolved in water. Cationic Starch being positively charged, has better affinity to the cellulose fibre and fillers, which are negatively charged and thus the retention of fillers, fibre bonding

are improved. Natural starch when chemically modified partially to have both anionic and cationic charges, is sometimes called as 'Amphoteric Starch'.

T

T.S.S: An acronym for Total Suspended Solids.

Table Rolls: Cylindrical rolls used in the slower and narrower width paper machines to support the wet end wire carrying the draining layer of stock to assist in the drainage of water and the retention and formation of the web. Sometimes referred to as tube rolls.

Table Top Paper: Any paper, usually kraft, which is suitable for coating printing, or lacquering and used in the manufacture of permanent table covers.

Tablet Back Board: A paperboard used as a stiffener for pads of paper. It is generally made of chipboard or newsboard of 0.30 mm and upward in thickness and its chief requirement is stiffness.

Tablet Blotting: A lightweight blotting paper used as the first sheet in a tablet or inserted in a box of papeterie.

Tablet Bristol: A lightweight bristol, either white or coloured, which is used for the cover of school tablets, etc.

Tablet Paper: A general term descriptive of any of the grades of paper used in the manufacture of tablets, but chiefly applied to book and writing grades. It has a fairly good writing surface. Uniformity of caliper is essential to facilitate the conversion process. Resistance to abrasion in erasing is also necessary.

Tabulating Board: A tag board used in automatic tabulating machines. There are two principal types-mechanical and electrical. The board is made from bleached, partly bleached, or unbleached chemical pulps, and an even machine finish free from twist or curl. The two types of tabulating board have the same specifications except that the electrical-type tabulating board is free of electrically conducting material. Physical tests are usually specified for other properties, such as mullen, tear, fold, stiffness, sizing, dirt, dimensional stability and in the case of the electrical type, electrical conductivity.

Tachnometer: An instrument used by paper mill technicians and operators to measure speeds of rotation of equipment, such as pumps, ventilating fans, line shafts, and motors, and to determine linear travel of the paper machine with respect to its relative component parts or sections.

Tack: Stickiness. For example, adhesives, some printing inks, varnishes and freshly painted or coated surfaces.

Tackle: The replaceable assembly of bars, knives, or the like which provide the working surfaces in a refiner or beater to fibrillate and cut fibrous raw material

preparatory to papermaking. The action of a refiner unit may be change drastically by installing an appropriately different tackle design.

Tag Board: A paperboard used for printed forms, envelopes, shipping tags, file folders, and many other purposes. It is manufactured of hemp jute, chemical pulps with or without mechanical wood pulp or various combinations of these, principally on a cylinder machine but sometimes on a fourdrinier machine. It is usually of a manila colour and has a smooth finish. Tag board possesses good bending or folding qualities, high bursting and tensile strength, high tearing resistance, and a high water finish, suitable for writing or printing.

Tag Stock: A cylinder or fourdrinier sheet suitable for the manufacture of tags. It may be made from a wide variety of furnishes, such as hemp fibre, sulphite, sulphate or mechanical wood pulp, and various type of waste papers, such as manila clippings, bottle-cap waste cuttings, and reclaimed shipping sack kraft. The board is sometimes tinted or coloured on one or both sides. It may be vat lined and is often coated. The more durable tag stock, such as those used in foundries, machine shops, laundries, nurseries, etc., are made of hemp and jute. Tag stock, depending upon its intended use, has the following properties to a greater or lesser extent; good bending or folding qualities, suitable bursting and tensile strength, good tearing and water resistance, and a surface adaptable to printing, stamping or writing with ink.

Tailing Screens: Screens in a pulp screening system that receive the rejected portions of raw pulp after they have gone through the primary screening operation. The accepted pulp is fed back to the primary screening operation and the rejected portion is fed to a rejects refiner before returning back to the primary screening operation.

Talc: Soapstone powder or talcum powder is a white or greenish-white mineral substance which is primarily hydrous magnesium silicate. It is used as a filler in paper and board.

Tailings: The rejected portions of raw pulp after it has gone through a primary screening operations to remove uncooked fibre bundles, coarse slivers, shives, knots and any other extraneous matter.

Tandem Thermomechanical Pulping (Tandem TMP): A wood pulping process in which chips are presteamed followed by two stages of mechanical treatment in refiners at elevated temperature and pressure.

Tanning Paper: An abrasive paper which is coated with silicon carbide and is used in the leather industry to condition tanned hides and skins for the final buffing operation.

Tar Paper: Any paper impregnated or coated with coal-tar or asphalt.

Tare Weight: The weight of the container, box, wrapping, or holding means which is subtracted from the gross weight of any packaged material to obtain the net weight of that material.

Target Paper: A paper used for printing targets. It is similar in character to manila drawing paper and made in a natural cluster white or a light-cream colour. It has a short fibre (usually mechanical pulp), which is punctured clearly by the passage of the bullet. Stiffness is important.

Tarred Brown Paper: A generic term for packaging paper, having some degree of waterproofing, consisting of one or more sheets of paper coated or impregnated with tar (coal or wood), bitumen or similar materials struck together.

Tea Bag Paper: A lightweight absorbent paper usually made from bleached manila hemp and long-fibred chemical pulp and specially treated to give high wet strength. Its chief characteristics are cleanliness, good absorbency, high wet strength, a sheet structure to permit rapid diffusion of the tea extract, and ability to perform satisfactorily in high-speed packaging equipment with which the tea bags are fabricated and filled.

Tear Factor: The tearing resistance in grams (per sheet) multiplied by 100 and divided by the basis weight in grams per square meter.

Tear Index: Tear index is the quotient of tearing resistance by the grammage. It is obtained on dividing the tearing force (expressed in millinewtons) by the grammage (expressed in g/m^2) of the conditioned paper/board.

Tear-Outs: Portions torn from the paper web for inspection or test.

Tear Ratio: The relationship between machine direction and cross-machine direction tearing resistance.

Tearing Resistance: The force required to tear a specimen under standardized conditions. Two methods of measurement are in common use: (a) Internal tearing resistance, wherein the edge of the specimen is cut before the actual test; and (b) Edge tearing resistance.

Telautograph Paper: A grade of paper used in the manufacture of small rolls for telautograph recording machines. The base paper is usually an English finish book grade. It is moderately sized to provide rapid recording ink absorption.

Telegraph Paper: Paper made for printing and converting into pads for telegraph messages. It is sized for pen and ink writing and offset printing, and must meet strict requirements for satisfactory mechanical handling in the central telegraph offices. Paper used range from 100 percent chemical pulp sheets,

sometimes in the form of carbonless copy paper, to sheets containing approximately equal proportions of chemical and mechanical pulp. The latter, usually yellow in colour, is predominantly used.

Telegraph Tape Paper: Paper somewhat similar in appearance to telegraph paper but satisfactory for gumming. After gumming it is cut into narrow-width rolls about 9.5 mm wide. The tape is threaded through the necessary device, which prints on the paper. It is then separated into individual messages and pasted on the telegraph blanks. Uniformity of caliper, good printing surface and low tearing resistance (to enable the operator to tear off strips for pasting to the blank) are essential qualities.

Teletype Paper: Paper usually in the form of small rolls or fanfolded packs, used on teletype (teleprinted) communications equipment. Such papers are usually made from mechanical and/or chemical pulps and have the usual characteristics of printing papers.

Teller Rolls: Small rolls of plain bond, tablet or other paper used on teller machines in banks, savings and loan companies, etc. These rolls are sometimes made in 2-ply carbonized or carbonless format and their use on teller machines is often tied into central computers.

Temperature of Cooking Zone (TCZ): A pulp mill expression normally used with continuous-type digester. It refers to the temperature of the chips and liquor in that portion of the digester considered to be the cooking zone.

Temperature Out of Heat Exchanger (TOS): A pulp mill expression normally used with continuous-type digester referring to the temperature of liquor after it has been heated to cooking temperature in external steam heaters.

Templet Board: A stencil board which is treated with wax and resins or other materials. Dimensional stability is important.

Tensile Energy Absorption: The energy absorbed when a paper specimen is stressed to rupture under tension. It is expressed in energy units per unit area for example T/m^2 . It is useful in evaluating packaging materials subject to rough handling.

Tensile Index: The tensile strength of a paper or board (expressed in Newtons) divided by the width of strip (expressed in metres) and grammage (expressed in g/m^2) of the conditioned paper/board.

Tensile Stiffness of Paper: Tensile stiffness is defined as the slope of the primary part of the load/elongation curve of paper.

Tensile Strength: The maximum tensile stress developed in a specimen before rupture under prescribed conditions. It is usually expressed as force per unit width of the specimen.

Tensiometer: A device used at various locations along the dry end of a paper machine. It consists of a roll which rides on the top of moving sheet of paper to feel or measure the tension so that it can be controlled.

Tension Control System: A paper machine dry and control system that receives a tension measurement signal from a roll (tensiometer) riding on the top of the moving sheet of paper and adjusts the speed of the dryers to compensate for any change.

Tension Wood: A wood with abnormal structure found in hardwoods.

Tertiary Treatment: Wastewater treatment beyond the secondary, or biological stage that includes removal of nutrients such as phosphorus and nitrogen and a high percentage of suspended solids. Tertiary treatment, also known as advanced waste treatment, produces a high quality effluent.

Test Papers: Papers, usually unsized that are impregnated with any of a variety of chemical reagents and used for detecting the presence of certain substances in solution or in gases and vapours by the appearance of colour changes.

Text Finish: A finish intermediate between antique and machine finish. It is closely akin to a vellum finish.

Text Paper: A paper of fine quality and texture for printing. Text papers are manufactured in white and colours from bleached chemical pulp or cotton fibre content furnishes with a deckled or plain edge and are sometimes watermarked. They are made in a wide variety of finishes, including antique, vellum, smooth, felt-marked and patterned surfaces-some with laid formations. Many of these papers are manufactured in matching cover weights. Designed for advertising printing, the principal use of text papers is for booklets, brochures, fine books, announcements, annual reports, menus, folders and the like.

Textile Paper: (a) A general term for strong wrapping papers of various weights, colours, and furnishes, used for wrapping bulk textiles such as bolts of cloth, etc. (b) A paper made of chemical or mechanical pulp or a mixture of these and used in the textile industry. It may be water or steam finished or machine finished on both sides; usually one side is rough. It is duplex in colour, usually being coloured on one side only.

Texture: Sheet surface qualities which usually can be identified primarily by touch and sometimes by sight.

Theme Paper: A school paper designed for themes, reports, etc. It is normally a bond or writing grade made from chemical pulps.

Thermal Compression Evaporation: A method of evaporation used on pulp mill spent liquors in which the steam removed from the boiling liquid being concentrated is compressed and fed back to the outside of the tubes of the evaporator. There it condenses and transfers its latent heat to the boiling liquid.

Thermal Conductivity: The rate of heat flow under steady conditions, through unit area, per unit temperature gradient in the direction perpendicular to the area. This property is important for structural insulating board.

Thermal Cycle: The complete circuit that heat travels throughout a mill, beginning with the conversion of original fuel into heat which is used to generate steam from water, followed by the distribution of steam to locations in the mill where it is utilized, and the return of the condensate back to the boiler in the powerhouse.

Thermal Efficiency: The ability of a basic steam power plant to produce mechanical power by operating with a fluid carried through a closed cycle. The level of efficiency is calculated from the ratio of work output to heat input.

Thermal Paper: Generally any paper with a heat sensitive coating. Typical of thermal papers are those used in hot stylus recording instruments, etc.

Thermal Pollution: Degradation of water quality by the introduction of a heated effluent. Primarily a result of the discharge of cooling waters from industrial processes, particularly from electrical power generation. Even small deviations from normal water temperatures can effect aquatic life. Thermal pollution usually can be controlled by cooling towers.

Thermal Refiner Mechanical Pulp (TRMP): Pulp made by presteaming chips, followed by mechanical treatment in refiner at atmospheric pressure.

Thermistor: A semiconductor whose resistance is temperature-sensitive, permitting it to transmit a signal when the temperature changes.

Thermo Compressor: An ejector or jet device that utilizes steam at a high pressure to entrain steam at low pressure and discharge the mixed streams at an intermediate pressure back to the process by reconverting velocity energy into pressure. These devices are used on dryer drainage systems on paper machines and on black liquor evaporators to improve their performance.

Thermocouple: A junction of dissimilar conducting materials used to measure temperatures in the pulp and papermaking process. Electrical current is produced around the junction and varies with temperature.

Thermo Mechanical Pulp (TMP): A high-yield pulp produced by a thermomechanical process in which chips are softened by pre-heating under pressure prior to a pressurized primary refining stage. Usually replaces or reduced the chemical pulp components in newsprint or groundwood papers.

Thermo Mechanical Pulping: A pulping process in which chips are presteamed before an initial refining treatment under elevated temperature and pressure, with subsequent refining treatment at atmospheric pressure.

Thick Black Liquor: Spent black liquor in a sulphate pulp mill after it is evaporated in multiple effect evaporators. It contains more than 50 percent total solids and is increased to 65 percent and above before incineration in the chemical recovery furnace. Also

called strong black liquor, semi concentrated black liquor.

Thick Pulp: Any pulp slurry having a high consistency generally between 10 and 16 percent.

Thickeners: Types of filters used to remove water from a pulp slurry by passing it over stationary screens or by the use of screen-covered rotating cylinders.

Thickstock Valve: A type of valve designed to operate on high consistency pulp slurries in the range of 10 to 16 percent.

Thin Black Liquor: Spent black liquor in a sulphate pulp mill obtained after washing the brown stock from the digesters just before being evaporated. It contains less than 15 percent total solids. Also called Weak Black Liquor.

Thin Paper: Any lightweight paper. The term usually is applied to such papers as Bible, Carbonizing, Cigarette, Condenser, Manifold, and like papers, but not to facial or toilet tissue.

Thinner: In the manufacture of resinous or cellulosic type finishes, volatile liquids that are not primary solvents for the ingredients are used to lower the viscosity and give certain other desirable properties. These are called diluents or thinner.

Thinning: A pulp wood forest management procedure in which selective trees are harvested to provide optimum growth of those remaining.

Third Press: The third and last set of press rolls following the paper machine wire, located just ahead of the dryer section.

Thixotropy: The phenomenon observed when the viscosity of a material decreases with time at a constant rate of shear. This reduction in viscosity is due to temporary breaking down of an internal structure of the system under shear. The viscosity of thixotropic materials depends upon the shear history or amount of previous work to which the material has been subjected. The property is important in coating colours as it enables the working of the colour formulation to a viscosity that permits the colour to be applied to the sheet and allows surface levelling due to after-flow of the colour on a sheet.

Thrasher: A machine used in a pulp mill, usually consisting of a revolving cylindrical drum or other means of beating old rags and paper to open them up so that loose dirt, dust or other foreign particles can be shaken out and removed.

Thrashing: The operation of passing rags as taken from a bale through a revolving cylindrical drum. It opens up the rags and removes loose dirt and dust that may be present. This operation is also called dusting. Waste papers may also be subjected to a dusting operation either before or after shredding or both.

Threading the Paper: The passing of paper over the paper machine when starting through a new sheet, once commonly done by hand on slower and smaller machines, now done mechanically by rope carriers.

Three-Pocket Grinder: A discontinuous type of pulpwood grinder in which the logs are fed against the grinding stone surface by three hydraulic rams. Operating through three compartments.

Three Stage Bleaching: A common multi-stage system of bleaching sulphate chemical pulp, in which the first stage is chlorination, followed by a caustic extraction stage and the hypochlorite stage.

Three Term Controller: A process control device designed to have three modes of operation: proportional, integral, and derivative.

Three Way Valve: Type of valve used in pulp and paper mills designed with three flow openings so they can be used for splitting and blending flow streams.

Throughput: The volume of material passing through process equipment used in pulp and paper mills also related to production.

Throwing the Seam: The act of twisting or 'cocking' the seam of a paper machine felt when it is too wide for safe operation. After the felt is run on the machine for a while and settles down, it is widened and trimmed to fit properly.

Ticker Paper: A communication paper made primarily from mechanical pulp and converted into small 12.5 mm wide rolls for use on stock quotations, tickers and the like.

Ticket Board: Various grades of paper and paper board used in the manufacture of tickets. Much of this board now has safety or antifalsification features.

Ticket Bristol: Any bristol used for ticket purposes. It is usually a bogus or mill bristol, depending on the quality of ticket contemplated.

Tickler Refiner: A type of stock refiner used in the stock preparation area for light mechanical treatment of fibres or as a trim refiner to give the fibre a touch-up mechanical treatment just ahead of the paper machine.

Tile Mounting Paper: Paper used to keep the pattern of small tile intact during the process of laying. It is commonly made from unbleached chemical pulps in a natural colour. It is usually calender size and has a rather open formation. The paper washes clean from the laid tile. Significant properties include low sizing and porosity and high strength and absorbency.

Tile Stock: A paper made from bleached chemical pulp which is used for the manufacture of high-grade embossed wall-papers and paper moldings. It is strong to withstand the processing operations.

Time Lag: The time during which a process variable undergoes an exponential change or delay in system output with respect to system input.

Time Sharing: A process control device or system, such as a computer, used to work on two or more tasks, alternating the work from one task to another.

Time Table Paper: Paper in widely varying grades used in arrival and departure schedules for various means for transportation. Quality varies according to subject matter used in the folder. It is usually made from chemical pulp, with a machine finish and of fair opacity and folding strength. This paper should be hard enough to give it some rigidity and to fold smoothly with and against the grain.

Tinted: A term applied to lightly dyed paper having relatively high visual brightness and little colour depth, as distinguished from a more heavily dyed sheet having considerable colour depth.

Tinted White: A term applied to white sheets containing small amounts of reddish blue, or blue and red dyes or pigments. The result is an almost imperceptible neutral gray which is more pleasing to the human eye than the yellowish cast of the corresponding untinted sheet.

Tinting: (a) In lithography, the production on an all-over light tint on the unprinted areas of paper, etc. It can be caused by ink emulsifying in the dampening water, or by soluble materials (usually proteins) in paper coatings that sensitize the nonimage areas of the plate to ink. (b) In papermaking, the operation of adding dyes or pigments to the sheet furnish or to a coating composition to produce tinted white or pastel shades.

Tissue Paper: A general term indicating a class of papers of substance usually below 25 g/m² of characteristic gauzy texture, in some cases fairly transparent. The class includes sanitary tissues, wrapping tissues, waxing tissue stock, twisting tissue stock, fruit and vegetable wrapping tissue stock pattern tissue stock, sales-book tissue stock and creped wadding. Tissue papers are made on any type of paper machine, from any type of pulp including reclaimed paper stock. They may be glazed, unglazed or creped and are used for a wide variety of purposes.

Titanium Dioxide: The white oxide of titanium, TiO₂. There are two crystalline forms useful to the paper industry; the anatase form employed primarily as a filler pigment and the rutile form used primarily in pigmented coatings. Both types are particularly useful because of their white colour, high brightness and high refractive index (2.52 - 2.76) which makes them highly effective for improving both brightness and opacity. Commercial grades are usually specially treated to facilitate use in the many papermaking and coating application and to provide particle size for optimum optical behaviour.

Tobacco Papers: Papers used for packing small quantities of tobacco, generally a low grade of

enameled or highly glazed paper, fairly bulky but pliable and soft.

Toggle Switch: A manually operated electric switch with a small projecting knob or arm that may be placed in either of two positions (on or off) and will remain in that position until changed. Other types are made for operation in more than two positions.

Toilet Paper: A sanitary tissue paper manufactured from a variety of furnishes primarily in bleached and semibleached grades. The most popular types are dry creped with some semicreped and facial tissue type in two or more plies of dry creped. Besides white, pastel shades and printed designs are in demand. Some qualities are developed through embossing during the converting process. The principal characteristics are softness, absorbency, cleanliness and adequate strength (considering easy disposability). It is marketed in rolls of varying sizes, or in interleaved packages.

Toner: A dry ink powder used for imaging in the xerographic process.

Tons per Day (TPD): An expression in British units of throughput and production of pulp and paper mills. In Metric units Tonnes per day is used in India.

Tooth: A characteristics of the grain in the surface of various papers of low finish. The term is used to describe their ability to take pencil or crayon marks. The roughness or surface contour of the paper is one factor in its tooth, and probably the fuzz and the stiffness of fibres projecting from the surface is another. Also referred to as bite.

Top: (a) The correct term for the so-called felt side of machine-made paper. (b) In paperboards composed of different stocks, the better quality side is usually referred to as the 'top' and the rest of the board composed of another stock, as the 'back'.

Top Blow: Rapidly lowering the pressure in the dome of a batch digester for a pre-set time period to cause a boiling effect and agitate the chip mass. This is done to facilitate a subsequent clean blow (removal of pulp from the bottom).

Top Side: See 'Felt Side'.

Top Sizing: Surface of tub sizing of paper which has already been internally sized.

Topliner: The outside liner of a paperboard. The quality of the pulp used depends upon the type of board produced. The top-liner may be applied to the filler or there may be an underliner between it and the filler.

Topping Turbine: A steam turbine in a powerhouse which exhausts to the mill process steam system instead of to a condenser.

Total Active Alkali (TAA): The alkali present as NaOH and Na₂S in alkaline cooking liquor or white liquor expressed in terms of Na₂O g/l.

Total Air: The total weight of air used by a power or chemical recovery furnace in order to supply the proper amount of oxygen for efficient combustion of the fuel or liquor. Depending on the design or the furnace it may be divided into primary, secondary, or tertiary and admitted at different locations.

Total Alkali (TA): (a) The alkali present in the sulphate pulping process cooking liquor (NaOH + Na₂S + Na₂CO₃ + 1/2 Na₂SO₃) expressed as Na₂O. (b) The alkali present in soda pulping process cooking liquor (NaOH + Na₂CO₃).

Total Alkalinity: The sodium sulphide (Na₂S) plus sodium hydroxide (NaOH) plus sodium carbonate (Na₂CO₃) plus sodium sulphite (Na₂SO₃) in sulphate pulp mill liquor, expressed in grams of Na₂O per liter.

Total Chemical: All of the sodium salts contained in sulphate or soda-pulping cooking liquor, expressed as Na₂O.

Total Chemical Loss in Alkaline Pulping: A percentage determined by dividing the total make up chemicals, such as salt cake and caustic soda added, to the black liquor recovery boiler by the total chemicals fed to the digester, all expressed as Na₂O.

Total Dissolved Solids (TDS): The total amount of dissolved organic and/or inorganic materials in pulp and papermaking solutions, such as black liquor, white water, other process liquids and liquid waste. It can be determined by evaporating a filtered samples to dryness and calculating the weight of the residual in g/l.

Total Dynamic Head: The sum of the discharge head and the suction lift developed by pumps.

Total Effective Alkali (TEA): The alkali present as NaOH and 1/2 Na₂S in an alkaline cooking liquor or white liquor, expressed in terms of Na₂O g/l which is the effective alkali taking part in sulphate cooking reaction.

Total Head: The pressure measured at the bottom of a pressurized storage vessel. It represents the sum of the pressure produced by the level of material contained within, plus any other applied pressure such as the level of the stock pulp the pad pressure behind the slice of a paper machine headbox.

Total Reduced Sulphur (TRS): The total sulphur compounds existing in gaseous sulphate pulp mill emissions, condensate and wastewater which are the result of the reduction of sulphur by various existing components, typically hydrogen sulphide (H₂S), methyl mercaptan (CH₃SH), dimethyl sulphide (CH₃SCH₃), and dimethyl disulphide (CH₃SSCH₃).

Total Solids (TS): The sum of dissolved and suspended constituents in pulp and paper mill process liquors, white water, chemicals, liquors, and waste effluents.

Total Suspended Solids (TSS): The total amount of undissolved solid particles of organic and/or inorganic materials in pulp and paper making solutions, such as black liquor, white water, other process liquids and liquid wastes. The amount of total suspended solids can be determined by filtering a sample and weighing the contents on the filter paper or by centrifuging it.

Total Titratable Alkali (TTA): (a) The $(\text{NaOH} + \text{Na}_2\text{CO}_3 + \text{Na}_2\text{S})$ in the sulphate pulp making process liquors, expressed as Na_2O . (b) In the soda pulping process it is $(\text{NaOH} + \text{Na}_2\text{CO}_3)$.

Total Transmittance: A particular transmittance measured in a standardized instrument specifically designed for the purpose. This quantity, taken together with parallel transmittance, is of importance in the determination of the transparency of transparent papers.

Total Volatile Solids (TVS): The solids in pulp and paper process liquors, solutions, and slurries which will vaporize on heating at a specified temperature.

Touch Paper: A paper saturated with nitrates or other salts so as to control burning properties.

Touch Check: A very strong paperboard made on a cylinder machine from extra-strong, usually unbleached, chemical pulps which may be blended with hemp stock. It may be coated on one or both sides and comes in a variety of colours. It is used principally for tickets, shipping tags, and wherever toughness is essential.

Towelling: A creped, absorbent paper made from either bleached or unbleached chemical pulp, with or without the addition of mechanical pulp. It should have sufficient strength to withstand use without disintegration or tear. Fast absorbency and water holding capacity are prime requisites. Other important characteristics are softness and freedom from lint and unpleasant odours.

Tracheid Cells: The fibrous, long narrow cells of coniferous wood that make up the principal fibre structure of most papermaking pulps made from it.

Tracing Paper: A paper for tracing original drawings, figures, patterns, curves, etc. It is a translucent greaseproof sheet, or a bond or manifold sheet chemically treated or oiled to increase transparency. Significant properties are proper receptivity to drawing ink and transparency so that prints can be made successfully from the tracings.

Trading Stamp Paper: A lightweight printing paper designed for the production of trading stamps. It is usually made from bleached chemical pulps. The most important technical characteristics are caliper, finish, formations, uniformity, and adequate but not excessive tearing resistance. Important functional qualities include good gumming and perforating characteristics, freedom from curl, ability to take

flexographic or offset printing and freedom from common web defects such as slime spots, holes, foreign particles, etc. Some trading stamp papers, are actually variations of safety paper with surface designs, hidden warning indicia, and/or other properties designed to prevent fraudulent alteration, imitation, etc.

Trailing Blade Coating: See 'Coating'.

Transducer: An instrument that receives information in the form of one physical quantity and converts it to information in the form of the same or other physical quantity.

Transfer Paper: (a) A grade of chemical pulp paper similar in its general characteristics to ground-wood poster paper, with the exception that the range of colours is greater. This paper is used for streetcar on bus transfers. Uniformity of caliper is important to the converter so that he may produce pads of transfers of uniform thickness. (b) Broadly, this term covers: (1) Paper coated with a pressure transferable mass, such as carbon paper. (2) Paper coated with moisture transferable film, such as the slip film of decalomania; (3) paper coated with a heat and pressure transferable film or mass which is furnished for hot die stamping of paper, cloth, leather, plastics, etc. The last group (4) constitutes the product generally known as transfer paper. It falls in two general classifications (i) metal transfer paper which usually consists of a transferable film of bronze powder and (ii) pigment transfer paper which, as the name implies consists of a transferable pigment film. The backing material may be other than paper; regenerated cellulose is sometimes employed.

Transfer Press: A type of wet press consisting of an arrangement of one suction-type roll and plain roll combination. It is used to both remove water from the sheet before it is dried on heated dryers and to transfer the web from a top felt to a bottom felt, or remove the web from the felt.

Transformer: An electrical device used in pulp and paper mills to transfer energy in an alternating current (ac) system from one circuit to another with attendant increase or decrease in voltage. It consists essentially of two independent electrical circuits linked with a common magnetic circuit, thereby making it possible for energy at low voltage to be transformed into energy at high voltage or *vice versa*.

Transformer Board: A dense paperboard used as layer insulation in power and distribution transformers and in many types of electrical apparatus. It is manufactured on a vat machine from sulphate pulp and cotton rags or a combination of these stocks. This material has a calender finish. The usual thicknesses range from 0.79 to 51 mm as made directly on the machines. Other thicknesses may be made by laminating. Particularly important are uniformity of

thickness and density, freedom from conducting particles, and excellent ply adhesion, which influences the forming and molding characteristics. The moisture content must be maintained at a low value compatible with good formation in order that shrinkage and warpage characteristics may be held at a minimum. General chemical purity and neutral reaction characteristics of all electrical papers are important. Sometimes called 'Presspahn Board'.

Transient State: A condition in which a process or control system is in a state of change.

Translucency: That property of a material which permits it to transmit light with strong scattering of the light so that transparency does not obtain. This property must be carefully distinguished from transparency — a sheet of bond paper is translucent, whereas a sheet of high-grade glassine paper is fairly transparent.

Translucent Master Paper: An unfilled bond-type paper made from fairly well-hydrated bleached chemical or cotton pulps or both for use as a master paper in the diazo (white-print) reproduction process.

Translucent Paper: Paper which permits the partial transmission of light but through which objects can be distinguished visually only when the paper is in direct contact with them.

Translucents: A soft cardboard, pasted or non-pasted made of chemical pulps with both sides coated with a pigment. It is used for booklet covers, window hangers, cards, etc. These boards are usually white in colour.

Transmittance: The fraction of incident light which passes through a specimen. This quantity has definite meaning only when the nature of the incident light and the design of the measuring instrument are specified. The variation of this property with wavelength of the incident light is of great importance for several applications of paper for example some wrapping and reproduction papers.

Transmitter: An instrument that responds to measured process variables by means of a sensing element and converts the measurement to a standardized transmission signal, which is a function of the measurement.

Transparency: The property of a material that transmits light rays so that objects can be distinctly seen through the specimen. The transparency ratio is a measure of transparency when a space separates the specimen and the object viewed through it. It is useful for glassine and other papers intended to be seen through rather than to conceal.

Transparency Ratio: A measure of transparency. It is the ratio of parallel transmittance to total transmittance, usually expressed in percent.

Transparent: Transmitting light rays so that objects can be distinctly seen through the material; said of certain thin papers.

Transparent Manifold Paper: (a) A very thin semitransparent manifold paper for use with duplex carbon, so that the carbon impression on the back can be read through the paper. (b) A lightweight greaseproof paper with high transparency.

Transportation Lag: A delay caused by the time required for materials to move from one point to another.

Transverse Porosity: See 'Lateral Porosity'.

Travelling Grade Stocker: A type of floor in a power furnace, usually coal burning, that conveys the fuel progressively through the furnace as it burns and discharges the ashes at the opposite end.

Tray: A collector plate located under machine web end wire table rolls and press to collect water that is squeezed or drained from the sheet and direct it into a storage chest for recirculation or filtering, and reuse.

Tray Clarifier: A type of multi-compartment tank used to separate settleable solids from green liquor in the recausticizing operation in a sulphate pulp mill. It consists of a flow box that distributes the raw green liquor to three or more tiers or trays which are scrapped with rotating arms to push the settleable solids toward the center where they fall and are discharged into a washer.

Tree Wrap Paper: A crinkled duplex kraft paper, a tar paper, or an asphalt-coated paper which is used to protect trees from sunscald, frost, and from rabbits and other rodents which feed upon young, tender bark. It may remain on the tree for two years or more before it disintegrates.

Trickling Filter: A synthetic or rock media filter, system used in the treatment of some pulp and paper mill wastewaters in which the biological growth removes waste organics from the waste-water as the wastewaters trickle through the media.

Trim: (a) The widest sheet of paper, trimmed to remove deckle edges, that can be made on a given machine. (b) To cut true to exact size by cutting away the edges of paper in the web or sheet. (c) The paper which is trimmed off the edges of a continuous web of paper or from the edges of sheeted paper.

Trimmed: Cut on two or more sides (of a sheet) to ensure exactness of angle at the corners.

Trimmed Size: The size of a sheet of paper or board ready for use by the ultimate consumer.

Trimmed Splice: A pasted joint in a paper web, the loose ends of which have been trimmed.

Trimming: Pieces of paper or board removed during processing, which may be suitable only for repulping.

Triple Paper: Three separate sheets used together.

Triplex: Having three layers bound together by three couchings or by pasting.

Triplex Board: Board consisting of three finish layers felted together during manufacture by pressure while still moist, without the use of adhesive.

Tripper: A device installed on chip conveyors, positioned over pulp mill chip bins, and mounted on four flanged wheels which ride on tracks on each side of the conveyor belt. The conveyor belt is looped back over two pulleys mounted in a frame so that the belt has a slope allows the chips to discharge from it into the chip bin.

Trough: A channel built in a 'V' shape and used to transport logs by chain or water, and also to convey chips from one location to another.

Truing: A mechanical pulp mill term referring to the procedure of putting a pulpwheel grindstone in perfect concentricity by dressing or buring with a diamond pointed burr.

Trunk and Case Fibre: A grade of vulcanized fibre (sometimes known as trunk fibreboard) having good bonding and forming qualities and a smooth, clean surface. Its principal uses are in the manufacture of trunks, cases, suitcases, receptacles, material handling boxes athletic goods, welders, helmets, etc.

Trunk Wrapper: A general term to designate wrapping paper used to wrap travelling bags and trunks during shipment and storage. It is generally made of long fibre pulp to have sufficient strength.

Tub Colouring: A method of dyeing paper usually in a converting operation in which the paper is passed by submergence through a suitable dye bath or into a flooded nip, the excess dye being removed by squeeze rolls and the paper then dried by suitable means such as steam-heated driers. This produces a deep brilliantly dyed sheet which in contrast to stock dyed paper is usually of poor fastness to crocking and bleeding. This operation is also called dipping and is a form of surface colouring.

Tub Size Press: Generally a unit of a paper machine, designed for relatively heavy applications of sizing agents to paper or paperboard, usually located between two drier sections, comprising a tub or vat for holding the liquid sizing material, and a set of vertically oriented press rolls the bottom unit of which is usually partially submerged in the sizing material. In the customary operation of a tub-size press, the moving web enters the tub under a dip roll, is totally submerged in the liquid sizing material for a brief period, and then flows the contour of the bottom press roll into the nip of the press in reverse fashion. As it leaves the nip, it follows the contour of the top press roll, and then continues its forward travel into a second drier section. The tub or vat is generally constructed of wood or metal, while the size press unit is usually but not

always made up of a pair of rolls of differing hardness and composition. Tub-size press units also include such auxiliary elements as pumps, piping doctor blades, liquid level devices, thormostats, viscosity controllers, spreading rolls, and the like. In addition to tub-size presses on paper machine, such units may also be used with converting or processing machines such as air-driers, impregnators, etc.

Tub-Sized: A term applied to paper or paper board which has been surface-treated and/or impregnated with natural or synthetic sizing materials in a tub-size press. The term is often incorrectly applied to surface-sized papers where a tub size press, as such is not used (*see* 'Animal Tub-Sized Paper').

Tube Board: Paperboard made of various raw materials in thickness from 230 µm up. Generally unsized and fairly smoothly finished. It is suitable for slitting into narrow rolls for winding and pasting into spiral or convolute mailing tubes, cores, etc.

Tunnel Drier: A well insulated sheet-metal tunnel or large box, through which paper or paperboard is passed for the purpose of drying. For boards the driers may be built in 8 or 10 tiers, with a wet saw and an automatic feeder. The former cuts the board into 12 or 16 foot lengths and the latter feeds one sheet into each tier of the drier in turn. Thus the board in the drier advance at a small fraction of the speed of the wet end. The drier is usually in three section: in the first, the board is brought to a high temperature by circulating hot air; in the second the temperature is maintained; in the third section the temperature is reduced to avoid burning the board as it approaches dryness. For lighter papers, such as wallpapers, the festoon principle of conveying the paper through the tunnel drier is employed or the paper may be conveyed between heated platens, the unprinted side of the paper resting on the lower platen.

Turbidity: Loss of transparency due to diffusion of light (normally applied to liquid in which diffusion is due to presence of particulate matter).

Turbine Meter: A flow measuring device having a bladed rotor mounted in a specially designed passage through which the fluid stream is directed. The flowing fluid stream rotates the rotor whose speed of rotation is measured and calibrated in rate of flow units.

Turbine Pump: A pump whose construction resembles that of a reaction type water turbine wheel with stationary diffusion vanes between the impeller and the free waterway of the casing.

Turn Over: An edge of the web that folds over at an occurrence of an edge-crack and is wound into the roll in the folded condition.

Turn Up: The completion of a roll of paper from the paper machine and the starting of a new one.

Turned Edge: An edge on a sheet of paper which has been doubled back, creased and held in that position by subsequent layers.

Turpentine Recovery: A process whereby turpentine is recovered by condensing relief gases from digesters, followed by distillation and chemical purification.

Turpentine Test: The procedure used to measure the time required for turpentine penetration, as an indication of the grease resistance of paper.

Twin Screw Feeder: A chip mover having two screw-like elements. It can be positioned at any point under a chip bin to pull out chips and discharge them in a constant stream on a conveyor belt. *

Twin Wire Former: A type of paper machine consisting of two endless wires used for sheet formation.

Twin Wire Paper: (a) Duplex paper made as two separate sheets on two different wires of the papermaking machine and later combined, thus giving twin sides or two top sides to the paper at the end of the machine. (b) Paper made on a fourdrinier machine fitted with two wires, configured as that the paper is formed between such wires and therefore has two wiresides.

Twinwire Machine: Any type of paper, paperboard, or pulp sheet forming machine that utilizes two wires.

Twist Wrap Paper: A paper used for wrapping pieces of toffes, etc. The paper should have high tearing and tensile strength to tolerate considerable torsion. This paper is usually waxed on one or both sides and hence preferably supercalendered for reducing the consumption of paraffin.

Twisting Paper: Paper generally made from a sulphate pulp, bleached or unbleached, on either a cylinder or fourdrinier machine. The paper may be slack or hard sized, depending on the converter's requirements, and may contain wet-strength agents. Colours used should be fast to light and bleeding. High tensile strength is required in the machine direction and some converters prefer, especially in the heavier weights, a paper what is soft and pliable. The paper is slit to various narrow widths depending on requirements, and is then twisted or spun into yarn to twine which may be woven or knitted into fabric. The paper may be treated during or after the spinning operation to give added resistance to wear and moisture. In commercial usage the paper is sometimes described by the end use as: Carpet tissue, fibre rug paper, etc. These papers are distinct from candy twisting or kiss papers.

Twitching: The hauling of logs by skidding or dragging with a horse-drawn skid during the harvesting of pulpwood.

Two Roll Press: A type of paper machine wet press used to remove water from a sheet of paper before it

is dried on heated dryers. It consists of an arrangement of one suction-type roll and plain roll combination.

Two Sidedness: The property of having appreciable difference in colour or texture between the wire and felt sides. The term is commonly applied to dyed papers, where the felt side is usually darker. It may occur due to several reasons: (a) due to mixed furnish of long and short-fibred stock or (b) high drainage of fines through wire or (c) high blending of dyes.

Two Stage Peroxide Hydrosulphite Bleaching: A multistage procedure for bleaching groundwood and semichemical pulps using a two-stage treatment with peroxide and hydrosulphite.

Two Term Controller: A process control device that has been designed to have two modes of operation: proportional and integral, or integral and derivative.

Two Way Valve: A type of valve used in pulp and paper mills designed with two flow openings and used to control or shut off the flow of streams.

Tympan Paper: An oiled or unoled paper use on printing presses for packing between the platen and the printed sheet. A hard even paper is desired which will serve for a maximum number of impressions. It is furnished in rolls and also in out and scored sheets to fit standard press sizes. It is generally a manila coloured paper of sulphite, kraft, or kraft and jute. Uniform caliper, permanent high finish, and freedom from dirt are important.

Typewriting Paper: Paper intended principally to receive an initial typescript, adequately sized, of high mechanical strength and having good resistance to the impact of the type of a typewriter and to erasure.

Typewriter Tissue: A light weight manifold designed to be used when many copies are desired.

Typography: (a) The art or process of printing from movable type. (b) The art and technique of setting and arranging written material in printable form.

Tariff Paper: An M.F. Book paper used for tariff rates for railroads and transportation companies. It is usually made of chemical and mechanical pulps. Opacity is fairly important and the paper should have a good printing surface and be able to stand considerable handling.

Thickness: The cross sectional width of a sheet of paper or board, also called caliper, generally measured in microns or mills.

U

U. Tube Manometer: A liquid column gauge built in the shape of 'U' and used as a basic measurement device for gauging low and differential pressures.

Ultra High Yield Pulp: Pulps made with a process in which 85 to 95 percent of the original fibrous material is converted into pulp, such as chemimechanical pulps.

Ultra High Yield Sulphite Pulp: A type of papermaking pulp manufactured by cooking fibrous material in bisulphite cooking liquor, followed by atmospheric refining under conditions that produce very high yields.

Ultra Filtration (UF): A filtration technique in which pulp mill spent liquor effluents are passed, under pressure produced by means of a pump, between semi-permeable membrane that retain polluting, toxic and coloured substances and molecularly separate useful products such as lignins, wood, sugars, etc.

Ultrasonic: Sound waves in the frequency of about 20 kHz. Sound at this frequency is sometimes used to detect chips, pulp, and other solid material levels in storage and holding tanks.

Ultrasonic Flowmeter: A flow measurement device that uses the time difference between upstream and downstream. Ultrasonic sound wave travel in a fluid moving through a pipeline as the basis of determining the velocity of the stream which, in turn, is calibrated into volume flow rate units.

Ultraviolet Spectroscopy: Identifying a substance by photography of spectrum lines in the ultraviolet region (wave-length) through a spectroscope.

Unbeaten Pulp: Pulp fibre that has not undergone any type of mechanical treatment with particular reference to beaters.

Unbleached: A term applied to paper or pulp which has not been treated with bleaching agents.

Unbleached Pulp: Pulp whose natural colour has not been modified by any treatment intended for this purpose.

Uncalendered: A term applied to paper that is reeled directly from the drying cylinder without passing through the calendars.

Uncalendered Paper or Board: Paper with a rough appearance on both sides after manufacture.

Uncoated Banks: A term applied to nonpasted or pasted banks to which a coating of clay has not been applied.

Uncoated Cover Paper: A term used to distinguish plain cover from coated cover. It may be embossed or decorated but not by a coating process.

Uncoated Free Sheet: An uncoated paper used for printing, writing and related applications, and made almost wholly from chemical pulps.

Uncoated Playing Card Stock: A heavy-weight paper designed as a base stock for conversion into playing cards.

Uncoated Postal Card Stock: An uncoated cardboard used primarily for the manufacture of postal cards.

Underdigested Chips: See 'Under Cooked Chips'.

Under Runs: Production and delivery short of the quantity ordered. Trade custom and sometimes specifications allow definite tolerances for under-runs.

Undercoating: Application of a self-leveling coating immediately preceding automatic application of glossy-finish coats.

Undercooked Chips: Partially digested wood chips in the pulp slurry leaving a digester in a pulp mill. They are screened out and usually recycled back to the digester. Also called Underdigested chips.

Underfire Air: Controlled, forced or induced combustion air fed beneath the grate and passed through the bed of a solid fuel furnace.

Underlay: A piece of paper or board placed under a printing form or type in a printing press to bring it up to proper height for printing.

Underliner of Board: Furnish layer of a board situated between an external furnish layer and the middle [*see* 'Middle(of board)'].

Under Liner: The last furnish layer of a board.

Underslice Showers: A shower pipe system located under the slice of a paper machine which provides a layer of water on the wire between the slice and breast roll for the stock to ride on.

Unfinished Paper: Any paper which has not gone through the finishing section, namely, cutting, sorting, counting, packing, labelling, etc.

Uniformity: The quality of being uniform in property, such as colour, finish, caliper, grammage, formation and evenness of fibre distribution in paper or board.

Union: (a) A very common pipe fitting used in mills to join or couple the ends of the pipelines. It is designed especially to facilitate frequent connection and disconnection. (b) An organisation of mill employees for the purpose of group representation in collective bargaining and other interests of the members with the mill management.

Union Paper: Paper produced by pasting together two webs or sheets of paper with bitumen tar (coal or wood) or similar materials.

Unit Slaker Causticizer: A combination green liquor gravity-type slaking and causticizing unit used in the recausticizing operation in a pulp mill in which burned lime is mixed and slaked in one unit.

Unoxidized Black Liquor: Spent black liquor in a sulphate pulp mill that has not been subjected to air or oxygen treatment prior to evaporation and combustion for environmental purposes.

Unreduced Salt Cake: Sodium sulphate (Na_2SO_4) passing through the chemical recovery furnace in a sulphate pulp mill and existing in the green liquor. It is usually expressed in grams per litre.

Unrefined Pulp: Pulp fibre that has not undergone many type of mechanical treatment with particular reference to conical and disk refiners.

Un sized: Not having been treated with sizing chemicals either during or after manufacture.

Untrimmed Machine Width: The maximum width of a paper or board it is possible to make on a given machine measured at the reel-up.

Untrimmed Size: Dimensions of a sheet of paper or board sufficiently large to allow a trimmed size to be obtained from it as required.

Unvulcanized Electrical Board: A paperboard made for use in panels upon which electrical instruments may be mounted. It is also used for tabletops and as a substitute for tiling. The board is made of waste-paper stock to which is added up to 30 percent of resin (usually phenolic). The board is subsequently subjected to heat and heavy pressure to cure the resin and harden the board.

Upflow Bleaching: Multi-stage pulp bleaching process in which the movement of the pulp and chemicals is from the bottom to the top of a vertical retention tower in each stage.

Upflow Clarification: A procedure used on wastewater from deinking of wastepapers in which the wastewater is introduced at the bottom of the treatment unit so that it is filtered through a blanket of suspended sludge.

Upflow Digester: Vertical, continuous-type pressurized cooking vessels in which the movement of chips is vertical from the bottom to the top.

V-Belt: A rubber composition connection belt made so that the top surface reduces to the bottom surface in the shape of a 'V'. It is used in V-shaped sheaves on various machine drives.

V-Board: Either solid or corrugated fibreboard. This board is characterized by the unusually high percentage of its dry bursting strength and effective lamination of components remaining after immersion in water for 24 hours as compared with corresponding grades of commercial domestic board. Boards of this type are used primarily for external packaging of commodities which will be subjected to storage or transportation hazards involving exposure to severe atmospheric conditions.

V.P.I. Paper: A grade of paper treated with Vapour Phase Inhibitors to provide antirust, antitarnish, and anticorrosion qualities. Such paper is widely used for wrapping metal parts, machinery, cutlery, and similar items which must be protected from corrosion during shipment, storage, etc.

Vacuum Box: A perforated, covered, narrow box extending across and over the area through which the paper machine wire runs so that it will remove water from the forming paper web by the use of suction

created by a pump connected to it. It is also used to remove water from wet felts in the same manner.

Vacuum Evaporation: Concentration of spent wash liquors in pulp mills by removing water with heat, usually in multiple-effect units maintained under negative pressure by an evacuation system.

Vacuum Filter: Any type of slurry filter in which suction is employed to deposit and form a pad of solids on the surface of a separating material (screen) with the liquid flowing through it.

Vacuum Filtration: Use of suction to deposit solids on the surface of a filter as the liquid flows through.

Vacuum Pickup: The lifting of the paper web from the wire of a paper machine in order to transfer it to the presses by using a suction-type roll which is lowered onto the wire between the couch and the drive roll, pressing pickup felt against the sheet.

Vacuum Pump: A pump designed and used to create and maintain a suction in mill process equipment, such as suction boxes, suction cylinders, and some types of filters.

Vacuum Save-All: A cylinder or disc-type vacuum filter used in paper mills to reclaim fibres from white water, as well as for deckering washing, or dewatering pulp stock.

Vacuum Transfer Press: Rolls used in paper machine presses for transferring the sheet from one press to another by the use of vacuum. The sheet is pressed against a pickup felt and becomes sandwiched between it and the press felt.

Vacuum Washer: Pulp mill equipment designed to separate undesirable components in a pulp slurry from the acceptable fibres using an evacuated, partially immersed, screen-covered cylinder to pick up the fibres from the slurry to form a mat, which is removed from further processing.

Valve: A variable orifice used to shut off or adjust the flow of a fluid by direct manual operation with a handwheel or lever, or remote operation with a signal generated by a manual station or automatic control device.

Valve Positioner: A device mounted on remote-operated valves with direct connection to the stem. It is furnished with its own power supply in order to cause the valve plug to assume a position proportional to an instrument output signal by overcoming stem friction, valve plug stem unbalance, and diaphragm and spring hysteresis.

Vapour Absorption System: A piping system used in paper machines to remove vapour leaving paper, which collects in pockets formed by the dryer.

Vapour Compression (VC) Evaporation: A method of evaporation used on pulp mill spent wash liquors in which the steam and vapour removed from the boiling

liquid being concentrated is compressed and fed back to the outside of the evaporator tubes, where it condenses and transfers its latent heat to the boiling liquid.

Vapour Permeability: That property of paper or paper board which allows the passage of a vapour. This property must be measured under carefully specified conditions of total pressure, partial pressures of the vapour on the two sides of the sheet, temperature, and relative humidity. Because of the fact that paper has specific affinity for water vapour, vapour permeability should not be confused with air permeability or porosity.

Vapour Phase Pulping: A chip cooking process sometimes use in pulp mill in which fully impregnated chips are separated from the excess impregnation liquor. Cooking subsequently takes place predominately in a vapour phase.

Vapour Recompression Evaporator (VRE): A procedure used in the concentration of pulp mill liquors by evaporation in which the vapour is compressed and returned to the shell side of the evaporator to be used as a heat source to evaporate more water.

Vapour Recovery System: A system used to collect various mill vapours, such as digester blow gases, from pulp mill and process them to prevent their emission into the atmosphere. This is accomplished by re-routing them to the drop leg of the chlorination filter in the bleach plant or to a furnace for incineration purposes.

Vapourizers: Specially constructed, thermostatically controlled vessels used to convert liquid chemicals, such as chlorine, into their gaseous state so they can be used in processes such as the chlorination of pulp during bleaching and the manufacture of hypochlorite bleach liquor in a pulp bleach plant.

Vapour Roof: Treated to resist penetration by gases or vapours.

Vapour Phase Inhibitor Paper: See V.P.I. Paper.

Variable Pitch Sheave: A grooved wheel that carries the connecting drive belt on a machine drive assembly. The pitch diameter can be changed by moving the driving motor base, thereby adjusting speed.

Variable Speed Winder Drive: A type of drive on a paper winder that allows the unit to be started at a slow speed and gradually increased as the paper roll starts to build up.

Variator: An electrical device used on rotary vacuum filters to adjust the rotational speed of the wire-covered cylinder of which the pulp mat is formed.

Varnish: A solution of a resin, such as copal, dammar, shellac, etc, in a solvent, such as turpentine, boiled linseed oil, methanol, etc, containing a drier, which after evaporation of the volatile constituents of the

vehicle and oxidation of the nonvolatile vehicle leaves a thin shiny of the dissolved bodies.

Varnish Label Paper: A coated or uncoated smooth printing paper made from chemical pulps, designed for use in varnished labels.

Varnishability: The measure or ability of a sheet of paper to accept varnish. A sheet with a high degree of varnishability would generally be smooth, of low absorption and would have a minimum amount of colour change on varnishing. Extent of varnishability depends on the type and composition of varnish lacquer and thinners used during varnishing operation.

Varnished Wallpaper: A wallpaper which has been varnished after the design has been printed. It has a washable surface.

Vat: (a) A term for handmade papers. (b) The receptacle that holds pulp from which handmade sheets are formed. (c) The oblong tank in which the cylinder of a cylinder machine is mounted and which contains a stock suspension from which the sheet is formed. (d) The tank used for tub sizing of paper. (e) The pulp slush container of a vacuum type drum washer.

Vat Dyes: Vat dyes applied in the paper industry in the form of pigments, which are characterized by having excellent light fastness and due to cost, are almost universally restricted to the tinting of high grade white papers.

Vat Liner: An adjective describing a paperboard that has been lined in the process of manufacture on a cylinder machine by having a stock or colour in the first or last vats which differs from that in the other vats and which becomes an integral part of the sheet when the plies are squeezed together by the press rolls. If the stock in both the first and last vats is different from that in the other vats the sheet is known as double vat lined.

Vat Machine, Cylinder Machine: A board or paper machine comprising one open-ended cylinder, or several open-ended cylinders in series, each covered with fine mesh wire and revolving partially immersed in a trough or vat of stock (see 'Stock'). Water draining through the wire leaves a mat of fibres to form a web or a number of Webs (see 'Web'). The wet web or webs are then transferred sequentially to the underside of a moving felt applied at the top of the cylinder or cylinders. The resultant combined web then passes through pressing and drying sections.

Vat Papers: (a) Handmade papers. (b) British term for papers made on a cylinder machine.

Vat System: A continuously recirculating system on a cylinder-type of paper machine in which the new stock from a regulating box is constantly added to the drainage water and from which the couched sheet is constantly removed by a pickup felt.

Vegetable Crate Liner: A vegetable parchment paper or heavy waxed, resin-treated, or parchmented kraft or grease-proof paper with sufficient strength to withstand water and the pressure used in packing vegetable crates. The paper may be creped or crinkled.

Vegetable Parchment Paper: A paper, resembling animal parchment, which is made by passing a waterleaf sheet prepared from cotton fibre and/or pure chemical pulps through a bath of sulphuric acid, after which the sheet is thoroughly washed and dried. The properties of the finished sheet are dependent upon the furnish, the paper making procedure used to make the waterleaf sheet, and the variations in the parchmentizing process. It is odourless and tasteless, either greaseproof or grease resistant and has high wet strength which is substantially maintained over a long period. It does not disintegrate in water or salt solutions either hot or cold and has high resistance to disintegration by many other solutions. The sheet may be softened by the use of plasticizers. It may be waxed, coated, embossed or crinkled. It has the following uses; (a) As a printing parchment, it is used for advertising brochures, greeting cards, letterheads, box liners, stationery, etc., and may be printed by offset, letterpress, gravure, thermography die stamping or silk screen. (b) In various weights and degrees of translucency or opaqueness it is used in packaging frozen, moist, greasy, or dry food products, such as; butter, margarine, dry pet food, meat and poultry. (c) As a carton liner for bake and serve goods. (d) As a Pan liner. (e) Translucent parchment is used for diazotype copymasters. (f) Special types are used as release paper and interleavers for the food, plastic, and rubber industries. *See 'Imitation Parchment'.*

Vehicle: The liquid portion of a material such as ink, paint, or coating composition, including the binders or adhesives and modifiers.

Vellum: (a) A strong, high-grade natural or cream-coloured paper made to resemble the fine parchment originally made from calf-skin. (b) A term applied to a finish rather than a grade. Social and personal stationery are often called vellums. (c) Tracing papers, both natural and those rendered transparent by suitable treatment.

Vellum Finish: A finish similar to eggshell, usually produced on a paper made from a harder stock than eggshell book paper. The surface is finer grained than in eggshell finish. It is produced by the use of special felts on the presses.

Velocity: The rate of motion or speed of a body at any instant.

Velocity Head: The head required to give water or other fluids its velocity of flow through a pipe.

Velour Covers: Cover papers coated with cotton, wool, or rayon flock and made in box cover or heavier

weights of cover paper. The effect is a pseudo leather appearance.

Velour Paper: One of several names for flock-dusted paper. An adhesive waterproof varnish or lacquer is first applied to paper. While this is in a tacky state, before it is dried, cotton, rayon, or wood flocks are dusted on the surface. The product is then dried and wound in rolls. Various decorative effects may be obtained by embossing in various patterns. This product finds use in box covering and as a cover stock for folders. Stocks employed are usually of chemical pulp.

Velvet Finish: A finish suggesting the feel of velvet. It is a dull surface.

Velvet Printings: A general term applicable to high grade printing papers having a soft surface texture.

Veneer: Thin fibreboard, or heavy ledger, highly glazed and used for coverings.

Vent: (a) To reduce pressure. (b) An opening in an enclosed vessel to provide relief of excessive contents.

Vent Stack: A flue or chimney mounted on storage or process vessels for the purpose of relieving foul or stagnant air or gases.

Vent Tank: A vessel into which excess material, air, or gases are relieved for possible treatment or return to the process.

Vented Nip Press: A grooved bottom press roll where purpose is to reduce the fluid pressure gradient within the nip of the press on a paper machine by providing an area of escape for the water pressed out of the paper and felt.

Ventilating Hood: A canopy located over process machinery, such as a paper machine dryer or a pulp washer to catch and confine the vapour before they have a chance to disperse in the room.

Ventilation: The process of introducing fresh air and expelling foul or stagnant air from areas such as in a paper machine room, bleach plant, and other process areas in a mill.

Venturi Flume: A liquid flow primary measurement device consisting of an open flume with a contracted throat. The contracted throat causes a drop in the hydraulic grade line. It is often used to measure mill water and waste.

Venturi Scrubber: A type of direct contact evaporator and fume collector which is also used to remove dust from alkaline pulp mill recovery furnace flue gas. It is characterized by a venturi section into which alkaline black liquor is spread into the throat where fine dust and fumes are carried with the fluid gases and are mixed with it, forming small droplets which through an evaporation process. The droplets then agglomerate, and larger dust particles are separated from the mixture in the cyclone-type evaporator section.

Venturi Tube: A fluid flow primary measurement device that consists of a closed conduit or pipe containing a gradual contraction to a throat. This contraction causes a pressure head reduction by which the velocity may be determined.

Verdol Paper: See 'Jacquered Paper'.

Verso: The reverse side of a sheet from the rests.

Vertical Bleacher: A pulp mill term for a batch-type bleaching vessel in which the height is much greater than the width and the flow of pulp is in the vertical direction.

Vertical Slice: A type of paper machine headbox outlet that regulates the flow of stock onto the wire by the use of a long narrow steel strip (called the 'top lip') which is moved in a vertical direction. It can also be bent in its own plane for local slice adjustment in order to change the profile of the sheets of paper being formed.

Vertical Stationary Digester: An upright type of cylindrical pressurized vessel in which chips and cooking liquor are charged, sealed, and heated with steam to reduce them into a pulp in a batch-wise procedure.

Vessel: A tubelike system of individual cells which conduct sap in the angiosperms or hardwood species of trees. The individual vessels have peculiarities of anatomy which permit the identification of the hard wood genera.

Vibrating Rotary Screen: A type of pulp screening device in which the rotating screening chamber or drum is put under vibration.

Vibrating Screen: A cleaning device made with a screening surface which is mechanically vibrated at high speed. It is used throughout the mill to screen chips, coal, and other solid, dry materials.

Vibrator: A device mounted on solid material storage vessels, such as chip and chemical bins, to provide a vibrating motion to the vessel's sides to aid movement of the mass downward, usually toward a bottom discharge opening.

Vibrator Chip Screen: A type of screening system used to separate good chips going to a pulp mill from the sawdust and slivers. It consists of a two-bearing, counter balanced, eccentric rotating shaft to impart vibrating action on the screen body.

Vibratory Deknotter: A type of coarse screen designed to remove knots and large pieces of trash from pulp coming from the digester in a pulp mill just before the washing process. It consists of a suspended screen basket kept under vibration.

Vibratory Stock Screen: A screening device used for trash removal from pulp slurries, especially wastepaper stock. The primary element is a basket with a bottom made of screen plates, and is freely

supported in a vat. Stock enters the basket and is shaken over the plates by the application of a vibrating action.

Vinyl Fibres: Synthetic resin fibres used in making specially paper by blending them with other synthetic and natural cellulose fibres in order to achieve specific physical and chemical properties.

Virgin Pulp: The pulp produced by any pulping process from fibrous raw material but not converted earlier in any paper or board. It contains no secondary or recycled fibres.

Virgin Stock: Pulp which has not previously been used in the paper making process. It is to be distinguished from secondary stock.

Viscose: A solution of cellulose xanthate prepared by dissolving the reaction product formed by the interaction of carbon disulphide and alkali cellulose in an aqueous solution of sodium hydroxide. Viscose has been used as a wet-strength agent and in coating or impregnation of papers. When forced into a coagulating bath it yields regenerated cellulose in the familiar forms of viscose rayon and cellophane.

Viscose Pulp: Chemically treated pulp in which the cellulose has been converted to cellulose xanthate and used to regenerate the cellulose fibres into synthetic materials such as rayon.

Viscosity: (a) The property of a fluid that is shown in resistance to deformation or flow, and in which the stresses are related to the rate of deformation. (b) The property of cellulose pulp or other polymer that is expressed by the viscosity of a solution of the materials in a suitable solvent under specified conditions.

Void Fraction: The ratio of the volume occupied by voids or air spaces to the gross volume of a sheet of paper. It may also be expressed as unity minus the solid fraction.

Volt: A unit of electromotive force in an electrical system equal to 1 ampere of current multiplied by 1 ohm of resistance.

Voltage: An electrical term referring to the force required to send 1 ampere of current through 1 ohm of resistance in an electrical system. It is analogous to head or pressure in a hydraulic system.

Vortex Beater: A stock preparation machine designed to combine pulping with heating. It has been used to disintegrate dried pulps and waste papers in the manufacture of paperboards and deinking operations.

Vortex Meter: A flow sensing device used to measure the flow of gases, liquids, and slurries. It utilizes the phenomenon that a regular series of vortices occur when these materials flow past a specially shaped object immersed in the flowing stream, with the number of vortices per unit of time being proportional to the flow rate.

Vortrap Cleaner: One of the first pressure-drop, vortex-type, pulp-cleaning devices in which the pulp was pumped under pressure tangentially to the side of a conical chamber, with the heavier particles of dirt settling to the bottom to be removed and the cleaned stock passing out through the top. Also called 'Vortex Cleaner'.

Vulcanized Fibre: Vulcanized fibre is made by combining layers of chemically gelled paper. The paper used is an absorbent grade of cotton or alpha wood cellulose. For most grades of vulcanized fibre, cotton cellulose paper is used. The chemical compound used in gelling the paper, which is normally a zinc chloride solution, is subsequently removed by leaching, and the resulting product, after being dried and finished by calendering, is a dense material of partially regenerated cellulose in which the fibrous structure is retained in varying degrees, depending upon the grade of fibre. It has high strength per unit weight, excellent impact strength and exceptional resistance to electric arc tracking. It can be machined formed, embossed, painted, or combined with other materials. It is used as electrical insulation, fuse tubes, lightning arrestor tubes, abrasive disk base, gaskets, textile bobbin heads, patterns tags, textile shuttle armor, trunks, wastebaskets, and welders, shields. It is made in the form of sheets, rolls, tubes and rods. Tubes are made by winding chemically gelled paper on mandrels of the desired inside diameter, leaching out the chemical drying calendering, and finishing by grinding and sanding to the desired outside diameter. Rods are made by machining strips cut from the sheets so that the grain runs lengthwise of the rod.

Vulcanizing: The process of treating an absorbent low ash white paper containing highly pure cellulose pulp with a solution of zinc chloride or other chemical to gelatinize the surface and convert it into a colloidal semifibrous mass, removing the gelatinizing agent by leaching and drying the sheet to give a hard, tough, dense product.

Vulcanizing Paper: A waterleaf paper made of rag (cotton) or chemical high alpha pulp and used as a raw material for manufacturing vulcanized fibre. Important properties are: high absorbency, chemical purity, low cupriethylenediamine viscosity controlled to proper limits for the respective fibre grade, uniform formation and relative freedom from foreign materials.

W

W. Board: Solid or corrugated fibreboard which is basically similar to W-Board except for lower bursting strength and caliper requirements. Board of this type is used primarily for interior packaging of items which will be subjected to unusual storage or transportation hazards involving exposure to severe atmospheric conditions.

W.F.: Water Finish.

Wad Stock: A paper board spun into a small, tightly wound, compact coil to form the base of a shotgun shell. It is made of reclaimed paper stock or chemical pulp. It has uniform thickness and density a high water finish, and water resistance.

Wall Fraction: The percentage of a papermaking fibre radius, which consists of the fibre wall.

Wall Board: (a) A type of fibreboard composed of a number of layers of chip, binders, or pulpboard, molded or pasted together and generally sized, either throughout or on the surface. It may also be nonlaminated and homogeneous in nature. (b) A general term used to indicate a composition material used in the construction of partitions, side walls, and ceilings in interior construction; it is made generally of waste papers, wood pulp, or wood or other materials.

Wallpaper: A hanging paper or tile stock which has been suitable printed or decorated for wall coverings. The paper is usually given a ground coat of clay or of casein-and clay, which may contain pigments to form a part of the final design, and then it is printed with oil inks, casein inks, or paints to complete the design. The paper may also be embossed or plastic coated.

Warm Colours: Paper colours in the red, yellow and orange range which produces a warm psychological visual effect as opposed to those in the blue, green, and violet which are called cold colours.

Warm-up Period: The time required after strating a piece of machinery, device, or process operation before it can be brought up to its rated performance.

Warning Indicia: A chemical compound or hidden printed design in safety paper, which changes colour or becomes visible when ink eradicators are used to alter the writing thereon.

Warping: Loss in flatness, particularly in paperboard.

Wash Roll: The first outside roll on the return part of the wire on a paper machine where the stock carried around with the wire is washed off and removed.

Washable Wallpaper: Wallpaper made water and abrasion resistant by the use of coating materials such as casein and soya flour, which are then chemically hardened. Synthetic resins or paint may also be used. The raw stock for such paper is sometimes made as a wet-strength paper.

Washboard Marks: Corrugation-like paper roll defects which run at an angle to the axis. They are caused by soft areas due to uneven paper thickness in the cross-machine direction of the sheet.

Washer: Pulp mill equipment designed to separate soluble, undesirable components in a pulp slurry from the acceptable fibres. It usually consists of some type of screening method combined with diffusion and

displacement with wash liquid, utilizing vacuum, or the natural force of gravity.

Washing: The process of separating soluble, undesirable impurity components of pulp slurries from the fibres. Normally this is done after cooking, and after the bleaching operation by the use of some method of screening combined with the use of fresh water and other liquids.

Washing Up: The cleaning of a paper machine wet end section and associated chests, pumps, and piping, along with the wire felts, press felts press rolls, slice, headbox, etc. It is accomplished with water during a shutdown, usually between running various grades of paper of different colours.

Waste Heat Boiler: A type of boiler installed behind alkaline chemical recovery incinerators to recover heat from gases in pulp mills.

Wastewater: Water carrying waste materials from a mill. It is actually a mixture of water, chemicals and dissolved or suspended solids.

Waste Sheet: A term used in bookbinding to designate a piece of waste paper which is tipped on the outside and over the regular book end sheets on single books and on the top and bottom of a pile of books to protect them from soiling during the progress of the book (or books) through the various binding operations. This sheet is also used for special instructions regarding the binding.

Waste Papers: Rejected piece of paper or board either from conversion or after use, which may be re-used as raw material during manufacture (*see* 'Broke').

Watchmakers Tissue: A tissue paper used by a watchmaker or repairer for holding small parts of a watch. This may be twisted into a sort of bag to keep the parts together. It is made of white cotton rags. The paper is strong and has a high, white colour so that small parts lying upon it are easily discernible.

Water Colour Paper: A typical drawing paper, tub sized, machine, air or loft dried and sometimes handmade. The chief characteristic is its hard-sized surface and surface texture suitable for water colours so that they will not run and yet not penetrate too deeply.

Water Cook: A trial cook made in a newly constructed pulp digester using water only (with no chips or cooking liquor) for the purpose of checking out the installation and operation and to make adjustments to the equipment before actual production is started.

Water Cooled Spring Roll: A spring roll which is designed to allow circulation of cooling water or brine within the roll shell to cool the paper web passing over it.

Water Finish: A high finish produced on paper or paperboard as it passes through the calender stack by

moistening either one or both sides with a fine spray of water or by troughs or boxes that supply a film of water to one or more calender rolls. The surface is more compact and more glossy than with a dry finish. It is not as uniform as a supercalender finish.

Water Finished Paper: Paper with high finish obtained by damping one or both sides of the web or paper with a film of water, usually applied by water doctors, during its passage through the stack (*See* 'Stack').

Water Glass: Sodium silicate solution in water is used as sizing material in papermaking to provide rattle and stiffness in paper and improve hydration of pulp during refining. It is also used as adhesive for making corrugated paperboard and in the lamination of solid fibreboard. Chemically water glass is Sodium Silicate of average composition of Na_2SiO_3 . The neutral variety contains $\text{Na}_2\text{O} : \text{SiO}_2$ in ratio 1 : 3.2 whereas the alkaline variety contains $\text{Na}_2\text{O} : \text{SiO}_2$ in ratio of 1 : 2. Generally in paper making a neutral silicate is used.

Water Hardness: A measure of calcium and other salts in mill water, usually expressed as mg/litre of calcium carbonate (CaCO_3). It can cause scale deposits in power and recovery boilers, cooling systems and other problems in the process.

Water Lined Paper: (a) A book or tablet paper having dandy roll water-marked lines running parallel to the grain of the paper. The distance between these lines varies according to the customer's requirements but usually ranges from 12.5 mm to 50 mm. (b) Paper usually for export to comply with foreign customs law provisions, marked with continuous lines in the machine direction by slight displacement of fibres (as in watermaking) by means other than the use of a dandy roll.

Water Pollution: The contamination of any receiving water bodies or streams by pulp and paper mill liquid effluents harmfully alters its physical, chemical, or biological properties.

Water Resistance: (a) The resistance of the adhesive bond between laminations of paper or board to delamination after prolonged soaking in water under specified conditions. (b) The ability of a shipping container to resist penetration by water in the form of rain.

Water Run: A trial run made on newly installed pulp and paper mill process equipment using only water.

Water Streaks: Streaks in paper, appearing as long, light areas which run with the grain. They may be observed by holding the paper to the light.

Water Treatment: The processing of mill source waters from rivers, lakes, and streams to remove impurities by sedimentation, filtration and the addition of chemical like alum, sodium carbonate and chlorine.

Water Tubes: Pipes aligned along the power and recovery furnace walls which contain the water that is heated and converted into steam. Collectively called water wall.

Water Turbine: A rotary motion producer used to drive generators, machinery, and pumps. It utilizes a wheel moved by the impingement of water on blades set in its periphery.

Water Vapour Permeability: A permeability specific to water vapour, because of the unusually high affinity of cellulose for water, water-vapour permeability does not correlate, in general, with the permeability of other vapours and gases.

Water Box: A container used on a calender, designed to provide a means of applying water, starch, or similar materials directly to the surface of the sheet, usually on heavier type paper and paperboards.

Waterleaf Paper: An absorbent paper containing no internal or surface size. It may be used as manufactured (for example, filter paper, blotting paper), or it may be used as a base paper for further processing (for example, impregnation).

Watermark: A deliberately produced design or pattern in paper, visible when viewed against a contrasting background, and caused by localized displacement of fibres by means of a raised or recessed pattern on the wire for example a wire mould or cylinder mould machine, or by means of a raised or recessed pattern on the surface of an open-ended cylinder (dandy roll) rotating in contact with the wet stock (*see* 'Stock') on the forming wire of the fourdrinier former.

Watermark Laid Dandy: A laid dandy roll carrying a design to produce watermark.

Watermark Wove Dandy: *See* 'Wove Dandy'.

Waterproof: Heavily sized, coated, or impregnated to resist water penetration.

Waterproof Board: Board into which water and moisture will not penetrate within a limited time under ordinary conditions. It is produced by including sufficient sizing in the furnish or by surface treatment.

Waterproof Paper: A water-repellent paper made by combining two sheets of paper by means of asphalt or by impregnating or coating the paper with a suitable waterproofing material.

Watt: A unit of electrical energy which represents the product of ampere and voltage, when 1 ampere of current flowing at 1 volt produces 1 watt of energy.

Wave Waviness: Distortion of the paper, generally at the edges, and usually in the cross direction.

Wavy Edges: Edges of printing paper that show irregular undulations, similar to warping in boards.

Wax Coating: (a) The operation of applying a coating of paraffin or other wax to a sheet of paper. (b) The coating thus applied to the sheet.

Wax Emulsion: A stable aqueous emulsion, usually of paraffin or micro-crystalline wax, and sometimes containing rosin, prepared by the use of suitable emulsifying agents and mechanical agitation such as provided by a colloid mill. Either acid-stable or alkali-stable products may be obtained depending upon the nature of the emulsifying agent employed. Wax emulsions are used for sizing or waxing of paper.

Wax Pick Test: A paper mill control test to determine adhesion and printing properties of paper. It consists of melting a series of arbitrarily graded wax sticks called Dennison Wax Sticks, allowing them to cool on the paper surface, and then pulling them away to identify at what stickiness level the fibres will pull away.

Wax Size: An emulsified solution of waxes and/or fatty substances added to the furnish stock in a beater or at size press to impart better water resistance, smoothness and feel.

Wax Sized Paper: A paper prepared from pulp which has been treated in the beater with an emulsified wax size or in which the sheet has a wax size added to it on the paper machine, either as a tub size or on the calenders. It contains less wax than a waxed paper.

Wax Spots: Transparent spots in a paper caused by undispersed particles of wax.

Waxed Board: Paperboard that has been waxed either by the hot or the cold process. In the manufacture of Hot waxed board, the board is waxed with hot paraffin without any attempt to congeal the paraffin on the surface of the board. In the preparation of cold waxed board, the board is treated with hot paraffin and immediately plunged into ice water to congeal the paraffin on the surface.

Waxe Continuous Household Rolls: Waxed paper used for wrapping food materials for storage in home refrigerators to reduce moisture loss; also for picnic and lunch food wrapping. The base stock for these rolls is normally a fully bleached chemical pulp MG or MF tissue.

Waxed Glassine: Glassine paper treated with paraffin wax, which renders it more transparent and more resistant to moisture and moisture vapour.

Waxed Kraft: Kraft paper in various weights which has been impregnated with wax or coated on one or both sides with a wax.

Waxed Paper: A general term applied to sized or unsized paper which has been impregnated or coated with molten wax in a separate converting operation. When the wax is impregnated into the paper, the product is referred to as Dry-waxed. When the wax remains on the paper surface as a coating, it is then

referred to as wet-waxed. It is generally used for wrapping and packaging purposes. Examples are Bread wrapper, carton liners, cracker box liner, etc.

Wax Tissue: A tissue which has been waxed by standard waxing methods to resist moisture and odours. It is used for making waxed sheet lunch rolls, waxed lunch envelopes and waxed butter wraps to protect food products against dust and vermin.

Waxes: Two forms of waxes are in common use; natural waxes such as beeswax and carnauba and petroleum waxes such as paraffin. Their most common use in the paper industry is in the manufacture of waxed papers, but waxes are also used in wax-size emulsions and other applications.

Waxing Manila: A chemical pulp paper tinted with a yellow dye. After waxing it is used as a cracker carton liner or for similar purposes. Desirable properties are good formation, finish and appearance and uniformity of paraffin absorption.

Waxing Paper: A paper for impregnation or for coating with wax or paraffin on one or both sides. It may be made of any furnish.

Waxing Tissue: (a) A specially sized, moisture-resistant paper used as the base stock for the production of waxed paper. It is manufactured from bleached and unbleached chemical pulps. (b) The term is also loosely applied to any tissue which is to be waxed.

Waybill Manila: A low grade tablet-type paper made largely of mechanical pulp and designed for the printing of railroad and express waybills and the like.

Weak Black Liquor: Diluted, spent cooking liquor resulting from the washing of sulphate pulp from the blow tank in a pulp mill. The liquor is the washwater not yet concentrated by evaporation.

Weak Black Liquor Oxidation (WBLO): Treatment of spent sulphate black liquor with air or oxygen (for environmental purposes) immediately after washing it from the pulp and before it is concentrated to about 50 percent solids in evaporation.

Weak Wash: A liquid stream in the kraft process which results from lime mud washing and is used mainly for dissolving smelt from the chemical recovery furnace.

Web: The sheet of paper coming from the paper machine in its full width or from a roll of paper in any converting operation.

Web Break: A break in a web of paper.

Web Calendering: The process of finishing paper by passing it through the calender in web form, as distinguished from sheet calendering.

Web Embossing: The embossing by means of rolls, of paper in a continuous web.

Web Glazing: The glazing or finishing of paper in web form.

Web News: A term of newsprint in rolls, that is a continuous web.

Web Offset: The process of printing paper in roll form by the offset printing process.

Web Offset Paper: Coated or uncoated offset paper made for printing in roll form. It requires more strength than sheet-fed offset paper, and if coated, some degree of water resistance, but less than for sheet-fed offset paper. Rolls must be uniformly wound and have no slack areas. To prevent heat blistering a porous sheet of low moisture content is desirable.

Web Paper: A printing paper in a continuous web or roll.

Web Printing: The process of printing on material that is fed into the press from a continuous roll. Web feeding is often indicated by placing the word 'Web' before the name of the basic printing process used, as 'web offset', but in the case of gravure the word 'Rotogravure' is used for this indication.

Web Stock: See 'Slow Stock'.

Wedding Bristol: A term applied to a group of high grade bostols made by pasting together two or more sheets of finished or unfinished paper in different thicknesses or plies. It may be plated to give various finishes; it is used for cards, announcements, etc.

Weddings: A kind of superfine writing paper of medium to heavy substance, slightly modified for better folding. Appearance is the most important factor to be considered. The finish is usually vellum or kid style, that is smooth to the touch, but lacking in sheen or glare. It may carry other finishes, as high plate or linen. It is particularly adapted to steel-engraved wedding announcements, but is frequently used for social correspondence.

Wedge Sampling: A method of taking samples from baled pulp to make moisture content determinations. It consists of obtaining wedge-shaped specimens from representative bales in predetermined lots.

Weight Tolerance: The amount that the weight of paper or paperboard is allowed to vary from nominal weight and still be considered within specifications for a particular order in accordance with standards set up by the industry.

Weir: A diversion dam or flow measuring device located in a liquid stream, and having a crest and side containment of known 'V' trapezoidal, or rectangular shape. The flow is related to the up-stream height of water above the crest.

Welding Ends: Pipeline and fitting connection ends that are designed for welding to another section or fitting.

Welding Paper: A special construction of asbestos paper used by welders to protect parts of castings that are immediately adjacent to the section to be welded. The paper is made of longer fibre than commercial asbestos paper. It should not emit obnoxious fumes at welding temperatures.

Well Closed Formation: An even, regular formation of fibres, producing a uniform appearance in a sheet, as opposed to a wild formation, which gives a mottled, cloudy appearance.

Welts: Elongated deformations, appearing as a continuous hump or series of alternate humps and depressions parallel to the machine direction.

Wet Bottom: A type of ash removal system in a power boiler using low ash fusion temperature coal. The ash is removed in a molten state, quenched in a slag tank, and pumped out as slurry.

Wet Broke: The undried waste stock taken off the paper machine at the presses or before entering the driers.

Wet Draw: The condition of the web of paper between the section at the wet end of the paper machine, that is whether it is tight or slack.

Wet End: That portion of the paper machine between the head-box and the drier section.

Wet End Additive: Any material which is added to the paper finish after the beating and refining process but before actual sheet formation on the paper machine. Typical wet-end additives include defoamers, retention aids, pitch control agents, slimicides, etc.

Wet End Finish: A finish produced by treatment of the paper at the wet end of the paper machine. Antique, eggshell, vellum and english finishes are produced by proper control of the felts and presses at the wet end.

Wet Machine: A machine used to form pulp into thick, rough sheets sufficiently dry to permit handling and folding into bundles (laps) convenient for storage or transportation. It consists essentially of a wire-covered cylinder which rotates in a vat containing the stock and collects the pulp on its surface from which the pulp is removed by a couch roll and a felt. The wet web is allowed to wind around the upper press roll until the pulp or board reaches the desired thickness, when it is stripped off the roll in the form of a thick sheet. The wet machine is also used to manufacture certain types of boards which are dried and finished; among these are binders, book, coaster, counter, dobby, electrical pressboard, filter, friction, fuller, genuine pressboard, heeling, innersole, leather, matrix, middle sole, shank, shoe, and trunk fibreboard.

Wet Machine Board: A grey-coloured, single-ply glazed board made on a wet machine, and used primarily for binding box hardcover books and in shoe manufacturing.

Wet Mullen: The mullen bursting strength of paper or paper-board after complete saturation with water.

Wet Press: The dewatering unit used on a paper machine between the sheet-forming equipment and the drier section. It applies pressure, or a combination of pressure and suction to the sheet to remove as much water as practical from the sheet of the driers. It consists of two or more pressure nips in various design arrangements. Each nip is formed by a pair of heavy rolls running against each other with provision for controlling the pressure to provide a graduated increase in pressure for each successive unit. One roll of each pair is usually rubber covered and may be perforated and fitted with an internal suction box for water removal at the nip by vacuum. The wet web is transported through the nip of each wet press unit on a felt which is bulky and porous to absorb water from the sheet under pressure and allow this water to drain away or be removed by vacuum.

Wet Roll: Stuck web caused by moisture, with discoloration or ply separation after roll is dried out.

Wet Rub: The resistance of wet paper to scuffing.

Wet Strength Broke: Paper which has been treated chemically to increase its wet strength and which has been discarded in the process of manufacture. Because of its high wet strength, this paper presents special problems in fibring. When the wet strength is produced by urea-formaldehyde or melamine-formaldehyde resins, it is normally defibred by means of mild acid and elevated temperatures. Some high wet-strength papers (for example, vegetable parchment) cannot be defibred by any feasible means. Similar defibring problems occur in the recovery on waste papers containing papers or high wet strength.

Wet Strength Paper: A paper which has extraordinary resistance to rupture or disintegration when saturated with water. This property is produced by chemical treatment of the paper or of the fibres from which it is made. Wet strength is to be distinguished from water repellency or the resistance of a paper to wetting when exposed to water. Wet strength is most evident and most significant when it occurs in absorbent papers. Normally a paper loses most of its strength when truly wetted with water. A paper which retains more than 15 percent of its dry strength when completely wetted with water may properly be called a wet-strength paper.

Wet Strength Resin: A synthetic material which is incorporated in paper or paperboard to improve its physical strength when wet. Urea and melamine formaldehyde resins and certain related materials are commonly used for this purpose.

Wet Strength Retention: The ratio between a given strength property of a paper or board when wetted and that of the same paper in the dry state measured under standardized conditions.

Wet Tensile Strength: The tensile strength of paper after it has been wetted with water under specified conditions.

Wet Waxed Paper: A paper which has been waxed by passing it through a bath of wax and immediately chilling the wax through the use of cooling rolls or as in more common practice, by passing the paper through cold water, so that the bulk of the wax will not penetrate the sheet but will remain on the surface.

Wet Weight: The weight of pulp as it is lapped or pressed, as distinguished from its air dry or oven dry weight.

Wet Wrinkle: A wrinkle or mark in a web of paper produced at the wet end of the paper machine.

Wetlay Process: A method of sheet formation used in making paper. It implies that its fibre constituents are carried by water and deposited, with the water being drained from it to form a web in a moist or wet condition, as contrasted with the air laid process in which the formation is in dry condition.

Wetness of Felt: The ability of paper machine wet press felts to accept water squeezed out of a sheet of paper at the nip. More wet the felt is, less is its acceptance of water.

Wettability: A term describing the relative affinity of a liquid for a solid surface. Wettability increase with increasing affinity and is measured in terms of the contact angle formed between the liquid and the solid. If the contact angle is zero, complete wettability is said to occur. If the contact angle is greater than 90 degrees, non-wettability exists.

Wetting Agent: A substance, usually a surfactant which improves the wettability of a solid surface by a liquid. Wetting agents are often used to improve absorbency and to improve pigment dispersion.

Wetting Agents: Materials used in paper and paper board to improve the affinity to liquids and to make them more absorbent. It is also used in the preparation of adhesive coating materials used in the paper and paperboard industry.

Wetting Down Wood Piles: A pulp mill practice of routinely hosing down pulpwood logs in storage plies to prevent deterioration and semi dry bamboo stacks for curing of stuff.

Wetting Out a Felt: An operation conducted on new wet felts for paper machines to assure that there is a film of water over each of the thread fibres in the woven fabric before putting it in operation. It is accomplished by running the felt around with a large amount of shower water and detergent until all the intrafibre air is removed.

Wheat Straw: A fibre source from wheat crop, used in the manufacture of the less expensive grades of wrapping papers and corrugating paper board.

Accepted stock of straw consists of stem of the plant cut at least 76 mm above the roots and top seed portion removal.

White: Having that colour produced by reflectance of all wave-lengths of light in the proportion in which they exist in the complete visible spectrum, or nearly in that proportion; devoid of any distinctive hue.

White Box Cover: Descriptive name for plain, embossed, coated, glazed, or decorated white paper used for box covers.

White Dextrins: Starches treated with acids and used in the preparation of adhesive coating materials in the manufacture of paper and paperboard.

White Fibre Sheathing: A sheathing paper used for special purposes where a clean white paper is required. It is commonly made of selected white paper stock.

White Liquor: The clarified caustic liquor made by causticizing green liquor from recovery furnace, which contains active alkali caustic soda and sodium sulphide, besides small percentage of sodium carbonate, and some polysulphides. White Liquor is used in sulphate cooking of raw material.

White Liquor Clarification: The removal of calcium carbonate (CaCO_3) and other impurities from the causticizing liquor, usually by gravity sedimentation in units called clarifiers. This takes place in the liquor recausticizing process of a pulp mill in order to obtain a clear liquor for cooking.

White Manila Paper: Siderun or defective news in nine-inch counter rolls or in sheets. It is also known as number 2 white manila. It is used in retail stores auxiliary wrapping purposes.

White Paper: A printer's term for unprinted paper, even though it be coloured.

White Vat Lined Chip: A paperboard used for fabricating setup boxes. It is made from wood pulp and/or wastepaper stock as a combination board. The board is rigid and the white surface is suitable for the inside box lining.

White Water: All waters of a paper machines which have been separated from the stock or pulp suspension, either on the paper machine or accessory equipment, such as thickeners, washers, and saveall and also from the pulp filters. It carries a certain amount of fibre and may contain varying amounts of fillers, dyestuffs, etc.

White Water Pit: A tank, usually circular and lined with glazed tile, located at the side of the fourdrinier wire section of a paper machine or the breast roll to receive white water drained from the table rolls and from the seal pit.

Whiteners: Fluorescent dyes used to improve bright look of the paper. Also called 'Optical Whiteners'

Whiteness: The degree of approach of the colour to that of the ideal white. Since so-called 'white' papers

have definite hue and colourimetric purity, their colour is often specified in some manner; the most common is a requirement for brightness, which is reflectance of a certain wavelength of blue light.

Whole Stuff: A term applied to rag pulp as it leaves the beater.

Whole Wood Fibre: Fibre manufactured by the reduction of wood or a fibrous state without chemical action and with essentially minimum delignification so that the final product has about the same composition as the original wood, with yield approaching 100 percent.

Width (of a Reel of Paper or Board): The dimension of a web of paper or board measured in the direction across the machine.

Wild: Having irregular formation or poor distribution of fibres, with a mottled appearance on look-through.

Wild Look-Through: Look-through (*see* 'Look-through') which is irregular and cloudy.

Willesden Paper: A strong parchment like product made by gelatinizing the surface of paper with cuprammonium hydroxide, which like sulphuric acid used in making vegetable parchment, or zinc chloride used in making vulcanized fibre, is a solvent for cellulose. If a thick sheet is desired, several gelatinized sheets are brought together and pressed before washing or drying. It is tough, water and fire resistant, and because of the presence of copper salts is resistant to rot, bacteria, fungi, and insect pests. It is also employed for insulating purposes, roof covering, etc. While this paper has been principally manufactured abroad, deriving its name from a London suburb, the term is considered important in international trade.

Windbox: A plenum chamber attached to and surrounding the burners on a power boiler to distribute air furnished by a forced draft (FD) fan to the burner.

Winder: (a) The machine which winds into rolls the paper coming from the paper machine reel. (b) The machine which rewinds into rolls the paper coming from a paper machine winder. The paper may be slit in the rewinding process.

Winder Welts: Grain-direction ridges in the paper sometimes formed on the surface of the paper roll in the process of winding, which are caused by uneven expansion of the paper due to moisture variation or excessive tension of the web or both. Winder welts often disappear after conditioning or printing. Winder welts can run into winder wrinkles.

Winder Wrinkles: Long grain-direction crease marks sometimes formed in the surface of the paper in the processes of winding. These marks are due to various causes, such as uneven moisture content in the paper, improper tension in the paper web, or imperfect alignment of the roll shaft. Since these marks are set in the paper, it is seldom possible to eliminate them.

Window-Envelope Paper: Envelope paper with a portion so treated with a transperentizing material that the address on the letterhead is visible through it, which eliminates typing the address on the envelope. The same effect is produced by cutting out a portion of the envelope and pasting over the opening a piece of translucent material such as glassine.

Windshield Wiping Paper: A creped, absorbent, lint-free paper with good wet-strength, made especially for conversion into towels for cleaning windshields, window, etc.

Wind Duster: A type of machine used to remove dust from cut rags in a pulp mill rag preparation operation. It consists of a revolving drum with helically arranged wings inside a screen, revolving in the opposite direction and through which the cut rags to be cleaned are blown.

Wipeing off Paper: Usually M.G. kraft, soft and unsized used in diestamping machines to wipe away surplus ink.

Wire Changing: A common and essential operation performed in every paper mill, consisting of the removal of worn wires on a paper machine and the replacement with new ones.

Wire Hole: A hole in a paper web caused by a hole in the fourdrinier wire, which prevents retention of the furnish at that spot.

Wire Life: The elapsed time from the initial installation of a paper machine wire to the time it has to be removed and replaced due to wear and other conditions experienced under normal operation.

Wire Life Extenders: Chemicals added in small quantities to the white water system of the wet end of a paper machine for the purpose of increasing the length of time before the forming wire has to be changed. These extenders retard corrosion and prevent chemical decomposition.

Wire Loading: The process of applying filler to the paper web while on the fourdrinier wire.

Wire Mark: The impression left in the paper by the machine wire or dandy roll of the paper machine. The term is also applied to the laid lines in handmade papers, although these are more usually termed wire lines.

Wire Pit: The large receiving chest located under the wire at the wet end of a paper machine. It is used to collect drainage water resulting from sheet formation of the stock furnish. In addition, it provides a source of dilution water to the stock furnish that is being fed to the headbox of the paper machine.

Wire Return Rolls: Cylindrical rolls located on the return run of a fourdrinier paper machine wire whose functions are to drive, guide and apply tension to the wire.

Wire Roll Doctors: Doctor blades mounted on wire retrain rolls and paper machine wet end sections to prevent stock buildup that would damage the wire.

Wire Side: That side of a sheet of paper which was formed in contact with the wire of the paper machine during the process of manufacture.

Wire Spot: A spot in a paper web caused by an imperfection in the fourdrinier wire.

Wire Turning Rolls: Those rolls on the paper machine web and whose functions include turning or helping to drive the wire. This function is sometimes performed by the couch roll or separate additional solid rolls.

Wire Wrap Paper: A flat, creped or extensible single ply or duplex kraft paper, applied either by hand or by machine, for wrapping all types of bare and insulated wire or more commonly reels of wire for protection during shipment. It is made in a wire range of basis weight; it may also be waterproofed.

Witherite: A natural mineral, primarily barium carbonate (BaCO_3), from which paper-coating materials are made.

Wood Chips: Small pieces of wood cut from a log by a chipper in order to be suitable for various pulping processes.

Wood Fibre: Elongated, hollow cells comprising the structural units of woody plants. The term 'fibre' is botanically applicable to hard-woods only, while in softwoods such cells are properly called tracheids.

Wood Flour: Finely ground wood or fine sawdust used chiefly as a filler in plastics, linoleum, etc., and as absorbent in dynamite.

Woodfree Paper and Board: Paper or board having no groundwood fibre in furnish but only chemical pulp in its fibre composition. However it may accidentally contain a small amount of other fibres or pulps.

Wood Handling: All operations conducted on pulpwood logs from the time the tree is cut down in the woodlands to its being converted into chips, including its transportation to the pulp mill site.

Wood Parenchyma: The living elements or cells of wood, located in the sapwood, which contain starch, oil and resins.

Wood Pile: A method of outdoor storage of pulpwood logs in a pulp mill yard when they are to be held in reserve for chipping and converting into pulp. The logs are usually stacked in large mounts.

Wood Preparation: Those operation conducted in a pulp mill to prepare wood for pulping, including removal of bark from logs, converting them into chips, and screening.

Wood Pulp: Fibre produced by the chemical or mechanical treatment of wood, or both for use in making paper, paperboard, rayon, plastics etc.

Wood Refuse: Wood chip rejects from pulp-screening operations which are chipped and crushed (hog fuel), and bark which is used as fuel alone and in combination with coal.

Wood Room: A room or building in a pulp mill where a system of machines and conveyors clean the wood, remove bark from logs for chipping and screen the wood into sizes suitable for cooking in digesters.

Wood Wool: A product manufactured by combing wood to a fine fibre; this wool is spread into paper with a fire proof material and an adhesive, such as asphalt, to obtain an insulating felt.

Wood Yield: A pulp mill expression indicating the quantity of pulp produced from a specific amount of wood, usually expressed as pulp per unit volume (cored or cubit) of wood.

Woodyard: The area on a pulp mill site where the pulpwood logs or chips are stored prior to being used by the mill.

Woollen Paper: An English term of a special paper free from metallic or other foreign matter, used for making supercalander rolls or bowls.

Wormed Rolls: Rubber-covered paper machine web end press rolls built with a worm-like surface design to provide a working action on the fibres on the felt passing over it, thereby keeping it in a spread and open conditions.

Wove: The usual type of wire mark on a sheet of paper. Wove papers do not exhibit the wire marks known as laid lines.

Wove Papers: Papers without laid lines (*see* 'Laid Lines').

Wove Dandy: A dandy roll which is covered with a wire cloth so as to permit the manufacture of wove paper.

Wrapping Crepe: A machine or secondary creped paper, usually unbleached kraft, made in a variety of basis weights. It is used primarily for wrapping objects of irregular shapes.

Wrapping Manila: A wrapping paper used in meat markets, grocery stores and the like. The significant properties are moderately high strength and a uniformly high water finish.

Wrapping Paper or Wrapper: A general term applied to a class of papers made of a large variety of furnishes on any type of paper machine and used for wrapping purpose. Strength and toughness are predominant qualities.

Wrapping Tissue: A term applied to a variety of tissues made of wrapping and packing or merchandise. Qualities vary in accordance with particular uses, but most requirement call for a paper that is strong well-formed, and clean, generally of basis weight between 12 and 30 g/m².

Wrinkle: A creaselike defect in paper produced during manufacturing or converting operations. It is classified as wet or dry depending on the moisture content of the sheet when the wrinkle is formed.

Writing Bristol: (a) Any bristol that has been sized for writing purposes. (b) An index bristol as opposed to a mill bristol. It is commonly referred to as a printing bristol.

Writing Paper: A paper suitable for pen and ink, pencil, typewriter, or printing. It is made in a wide range of qualities from chemical and mechanical pulps and rag pulp, or mixtures of rag and chemical pulp or chemical and mechanical pulp. Distinctive finishes and colours produce variations in this class of paper which through long usage have established them as well-known grades of paper. Thus, there is fine and extra-fine writing, azurelaid, azure/wove, cream laid, creamwove, maplitho papers, Bank, Bond, Airmail, Parchment, Copier paper, Boxed, chemicalmanila, commercial flat, folded, industrial, laid, machine-dried, manila, railroad, superfine, tablet, etc. each in a form, finish or colour to meet a particular use, but all fairly typical of this class of paper. The most significant class property is good writing and ruling surface. For some uses, good strength and erasability are also necessary.

X

X-Paper: A fairly strong paper made from sulphate pulp with a surface that readily accepts crayon, pencil, and other marks. It is used primarily to make patterns for designing and making clothes. Also called black pattern paper.

Xerocopy Paper: A general term for any grade of paper suitable for copying by the xerographic process. However, commercial xerocopy papers are usually modified bond grades made from chemical pulps and characterized by a smooth finish, heat stability, non-curling qualities and good aesthetic properties such as colour, brightness and cleanliness.

Xerography: A dry method of reproduction of graphic matter, in which an image is produced in the form of electrostatic charges by reflecting the image onto the surface of a charged photoconductor which holds its charges in the dark but dissipates them when exposed to light; the image on the photoconductor is developed by bringing it into contact with an ink powder, called a toner; the powder image is then transferred to copy paper and fixed to the sheet by heat fusion.

Xylem: The woody portion of a tree stem or root.

Y

‘Y’(Wye): A type of pipeline fitting with three ports located at other than 90° angles with each other. Same as ‘Y’ (Wye).

Yankee Machine: A paper machine using one large steam-heated drying cylinder for drying the sheet instead of many smaller ones. The wet sheet is pressed against the surface of the Yankee drier and may be held in place of a canvas drier felt as the drier revolves. It produces a glazed finish (machine glazed) on the side of the sheet next to the drier. The machine may have a cylinder or a fourdrinier wet end and may have any number or presses or auxiliary driers of the usual type; its characteristic feature, however, is the large drier (2.75 to 4.6 meters in diameter).

Yard: (a) The area on a pulp mill site where raw material or chips are stored prior to being used by the mill. (b) A linear measurement equal to 3 feet.

Yellow Pulp: A term applied to unbleached straw pulp.

Yellow Straw Paper or Straw Board: Paper or board (respectively) made from unbleached straw pulp to the exclusion of other pulps. It is generally of a yellow colour.

Yellow Waybill Copying Tissue: Yellow copying tissue of sulphite, hemp or mechanical pulp, used for duplicating railroad waybills.

Yellowing: A gradual change from the original appearance of a pulp or a paper as a result of environment or ageing. It is especially pronounced in mechanical pulp or paper but will occur to varying degrees in all types of vegetable fibre. It is sometimes called colour reversion.

Yield: The amount of a substance usually expressed as a percentage of starting material which remains after a processing action.

Young’s Modulus: It is ratio of stress to the corresponding strain and is usually denoted by the letter ‘E’. It is a measure of the intrinsic rigidity or stiffness of the paper strip.

Z

Z-Direction Tensile Strength: The tensile strength perpendicular to the plane of the sheet. It is used as a measure of bonding strength.

Z-Directional Strength: The strength of paper and paper board as related to the force and measured by means of tension applied perpendicular to the surface of the test sample.

Zeolite: A hydrated alkali-aluminium silicate ($\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot (\text{SiO}_2)_x \cdot \text{H}_2\text{O}$) capable of exchanging alkali for calcium and magnesium and thus commonly used for water softening.

Zero-Span Tensile Strength: The tensile strength of a sheet of fibrous material, measured with special jaws, at an apparent initial span of Zero. It indicates the strength of the material comprising the fibres.

Zeta Potential: An electrokinetic potential existing between the fibres and surrounding liquid in a pulp slurry, and one of the forces that tends to hold the fibres in a stable suspension.

Zig-Zag Paper: Paper that is embossed or water-marked with a design having short lines or sharp angles.

Zinc Finish: Paper plated between zincs.

Zinc Hydrosulphite: A chemical $\text{ZnS}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ which is formed by the reaction of sulphur dioxide with an aqueous suspension of powdered zinc. It is used in bleaching mechanical pulp.

Zinc Liner: A metal plate applied to the top and bottom of each sheet of paper in making a plater book.

A typical combination would include a top zinc liner, a sheet of textured cloth or paper followed by the paper to be plated, followed by a bottom zinc plate.

Zinc Sulphide: ZnS , a pigment used as such or as a component of Lithopone as a loading material or a coating pigment.

Zinc White: Zinc Oxide (ZnO) a product made in high-temperature furnaces is used as a filler to impart opacity and colour. ZnO is also used in certain duplicating papers due to its ability to pick up, retain, and release an electrostatic charge.

Zincs: Polished sheets of zinc used in plating.

ANNEX A

(Foreword)

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